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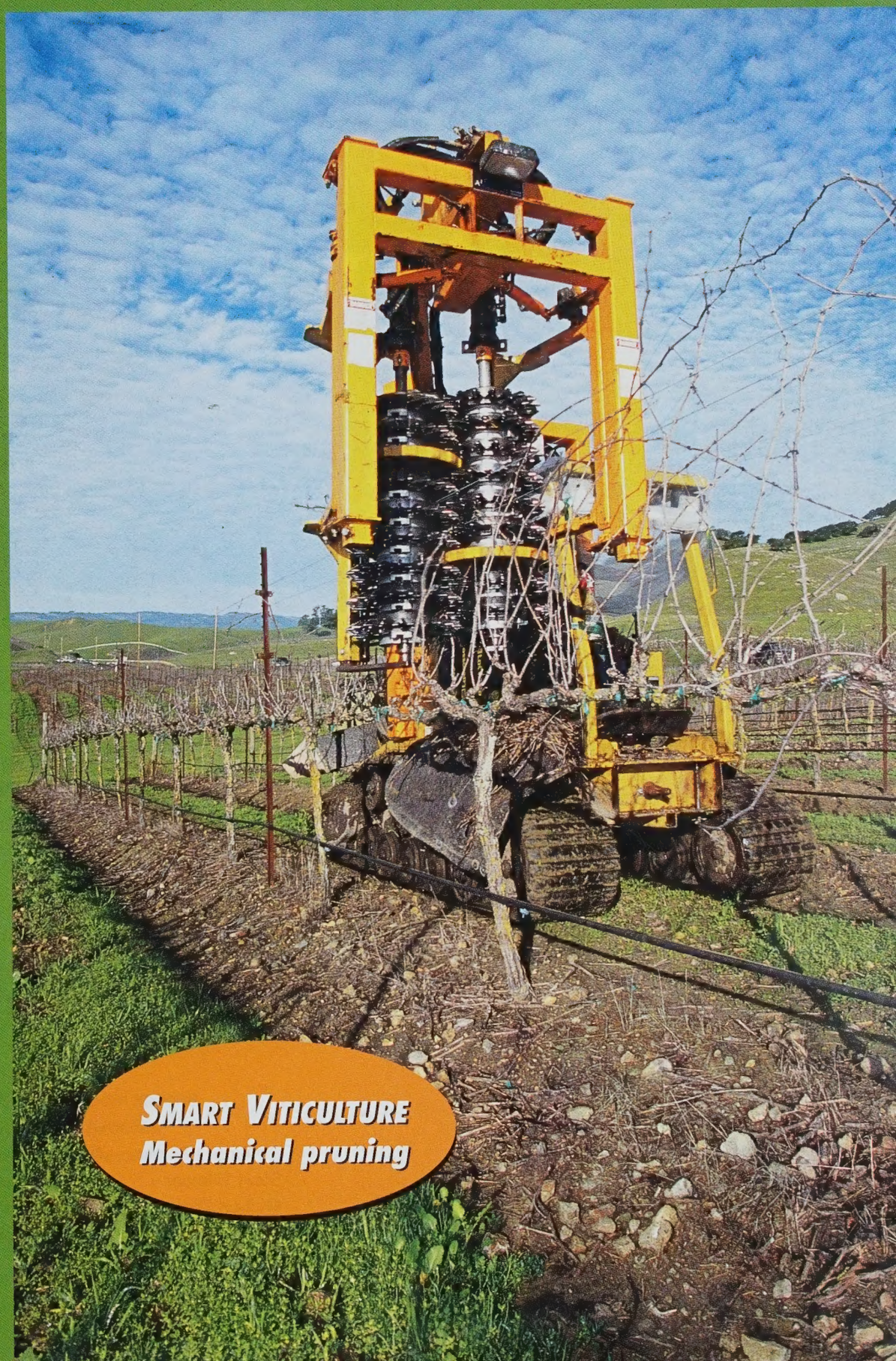
Managing mites, good, bad, enigmatic

VARIETAL REVIEW
Pinot Grigio
Ideas from Italy, Alto Adige and Friuli

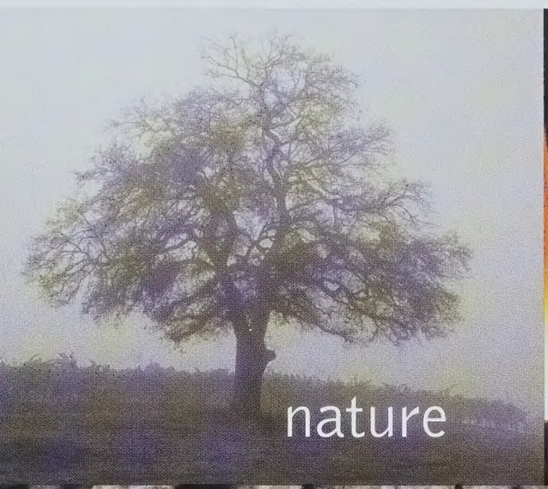
Soil texture in the vineyard

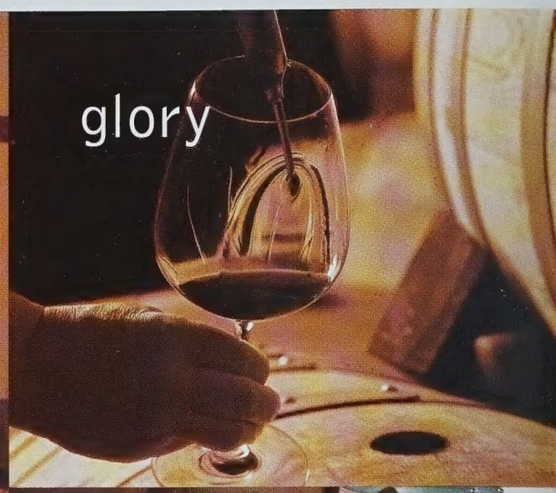
SHOWCASE
Vineyard Equipment



SMART VITICULTURE
Mechanical pruning

a wine story





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PRACTICAL WINERY & VINEYARD (ISSN 9739-8077) is owned and published by PWV Incorporated. Published bi-monthly at subscription rate of $31/year. Outside the United States, please add $10US, sea mail; $18US, air mail. Postmaster: Please send change of address to 58-D Paul Drive, San Rafael, CA 94903. Back issues: $5 prepaid. News media may use no more than 1/4 page of material per issue provided that PRACTICAL WINERY & VINEYARD is credited.

PRACTICAL
PW WINERY & VINEYARD

MARCH/APRIL 2002 • VOL. XXIII, NO.6

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DIEMME Kappa

Mechanical pruning Where are the engineers?

BY Dr. Richard Smart

Winter is the time of year for pruning grapevines. Normally the weather is not pleasant. In California, it is wet and often raining. In the eastern U.S., snow often blankets the ground, and the air temperature ranges from low to very low. Altogether very unpleasant conditions for being outside.

Of course, winter pruning requires outside activity, so allow me to offer this important consolation: It is among the cheapest forms of crop control available to the viticulturist.

I often see vineyards that are crop-thinned late in the season, which is a very expensive operation. The same vineyards may be poorly pruned, with too many buds retained. This is common in Australia.

Pruning has traditionally been done by hand. However, in the last 20 years many people have come to question this method of winter pruning. The most important consideration is typically cost.

Most growers are aware that cane pruning is more expensive than spur pruning. The former typically requires 50% more time than the latter. Spur pruning requires about 35 hours per acre, cane pruning about 50 hours per acre including wrapping and tying.

Another consideration is labor availability. In many regions, labor is becoming difficult to find and is less well-trained. This means that the pruning job is often not so well done. High quality work is especially important for cane pruning, while spur pruning is easier for untrained people to do.

Mechanical pruning

Mechanical pruning has been widely used over the last 30 or so years. It has been developed for spur-pruned vines, and I am unaware of any totally mechanized system for cane-pruned vines. Among winemaking countries, Australia has seen the most rapid adoption of this technique. A persistent labor shortage contributed to its rapid adoption there.

Interestingly, mechanization of the sugar cane harvest was among the reasons for introduction of mechanical grapevine pruning. The same workers who previously provided the labor for the manual sugar cane harvests subsequently moved on to grapevine pruning in winter. When they lost their jobs in the sugar fields they found permanent work and thus became unavailable for vineyards.

The earliest research with which I am familiar was carried out in New York State in the 1960s by Professor Nelson Shaulis and his engineering colleagues. This research was part of an overall program of vineyard mechanization research that ultimately led to the commercial adoption of mechanical harvesting. Shaulis found that the benefits of pruning mechanization had to do with labor saving: the machines not only performed the same job as human labor, but they did so with vastly improved speed.

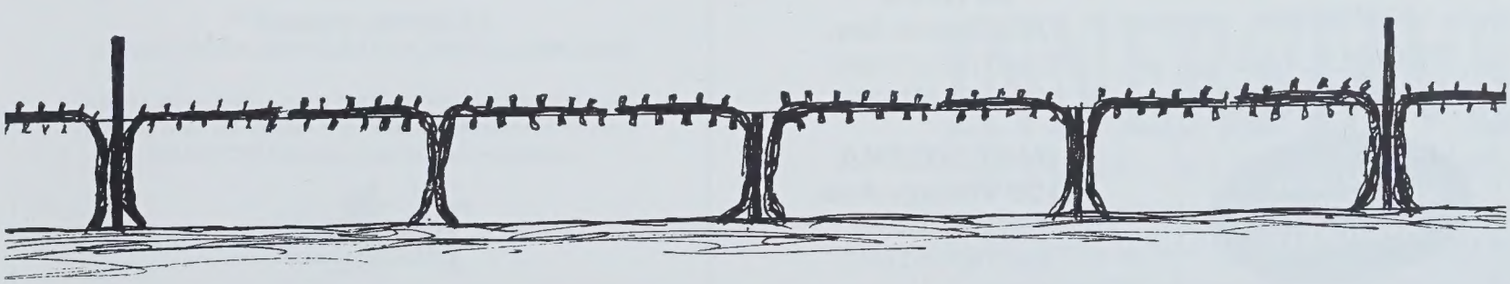
The first pre-pruners were simple cutter bars, which are still used today. In Australia, there is some use of circular saws, which are useful when wood older than one or two years is to be cut. A trellis with cordons accessible to the machine is preferred as the training system.

The easiest systems to mechanically pre-prune are the "Californian sprawl" and the VSP (vertically shoot-positioned). The machine should be able to remove some or all of the canes that are attached to foliage wires by tendrils.

The traditional Scott-Henry trellis is cane-pruned, and so cannot be mechanically pre-pruned, though the less common spur-pruned version can be. The Smart-Dyson system can be pre-pruned, though it requires a machine that can cut both above and below the cordon. Such a machine would be simple to develop using cutter bars.

A horizontally divided trellis (unfortunately known as quadrilateral-trained vines in California), somewhat like a non-shoot positioned lyre (basically a double VSP), can also be pre-pruned.

In the early days of mechanical pruning, many growers wrestled with the question of whether to do follow-up pruning by hand in order to regulate bud numbers. It soon became clear that there was (usually) no need for this



Vineyard design to facilitate mechanical pre-pruning. Uneven vine spacing and alternate short posts.

(depending on the variety and the wine program for which the fruit was destined). The grapevine was, in fact, able to regulate its crop and adjust for large bud numbers left by mechanical pruners. These bud numbers may be up to five times more than those left with conventional hand pruning.

Also, the spur length (with mechanical-pruning there was no concern for spur length as in pruning done by hand) was not the conventional two-bud spur. Spur length was variable, and as a result of mechanical pruning, the spurs spread farther and farther from the cordon. A mechanically pruned vine in Australia is not regarded as a pretty sight. There may also be large cuts on the cordon, which predisposes invasion of fungi such as *Eutypa lata*.

Ideal mechanical pruning

I believe that mechanical pruning should be followed up by a hand operation. This ensures that the correct bud numbers are retained per vine. I have previously written in this column (See "Golden Rules of Viticulture," September/October, 1993 *PWV*) about my views on appropriate bud numbers to be retained at winter pruning.

For balanced vines, I believe one should leave around 30 buds per kilogram of pruning weight or 14 buds per pound. Obviously one must determine the pruning weight before mechanical pre-pruning. Once determined for monitor-vines in the vineyard, the correct bud number can be applied to the remainder of vines in the block.

The mechanical pruner may be able to do more than half the pruning job (as an aid to hand pruning). Shoots are cut to about the two- to three-bud length, and prunings can be removed from the wires.

Pre-pruning can be carried out above and below the cordon, as is required with the Smart Dyson trellis. This leaves the final operation to be done by hand, which involves adjusting bud position and bud number. This hand follow-up pruning is normally done very quickly, at about walking pace. So the labor input for a mechanically pre-pruned vineyard is about half the time for one done totally by hand.

Engineers please help

Many of the machines I see used in vineyards are very expensive. Some of them also seem unnecessarily complex. I believe there is a need to return to simple pre-pruning machines. I will list below what I see as desirable attributes of a mechanical pre-pruner:

First, it needs to be able to cut through one- and two-year-old wood. It does not need to cut through thicker wood (but should be able to withstand the rigors of field use), so a simple cutter blade will suffice.

Second, the machine needs to be able to remove prunings from the foliage wires. This can be done with expensive multiple blade machines,

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but also with simple cutter bars operating at two or three heights above the cordon. The prunings often fall to the ground, but sometimes need to be removed from around the trellis post by hand, especially with VSP systems, which have many foliage wires.

Third, and most important, the pre-pruning machine needs to avoid trunks and posts. This means the machine must be able to sense any rigid object like a trunk or post, and retract the cutting mechanism as the machine passes. The machine must quickly swing back into the vine row after the trunk or post has been passed.

In New Zealand in the 1980s, I was involved with development of such a machine. It used a mechanical finger to activate a hydraulic piston to move the cutting mechanism. Obviously, the fewer contacts with immovable objects the better, as there will be fewer parts of the vine left unpruned.

Viticulturists can help, too

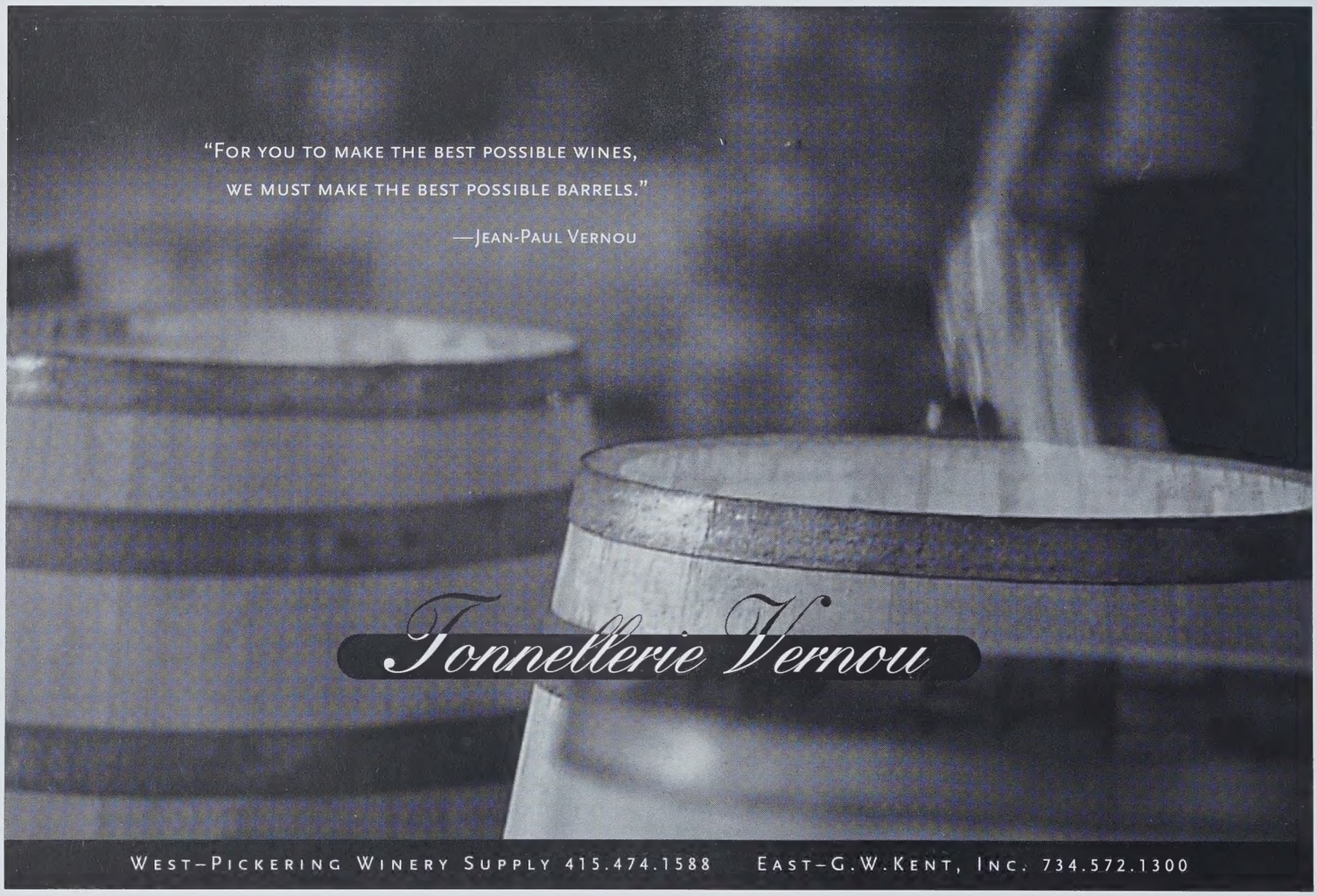
When planning a vineyard, we can aim to minimize the number of contacts by the pre-pruning machine with posts and trunks. The farther apart posts are spaced, the less frequently the machine will need to dodge them. This leads to an interesting idea of replacing every second tall vineyard post (which are normally spaced about 20 feet apart) with a half-post which reaches only to the fruiting (cordon) wire. After all, most of the weight that a post has to bear is the fruit at cordon height.

Therefore, every second post need not extend above the cordon, but in most vineyard situations we need only half-posts for every other post. The foliage wires do not need to be supported every 20 feet, as every 40 feet is fine. The foliage wires should of course be tight, irrespective of post spacing. I would not suggest use of half-posts in a site exposed to strong winds.

Another tip that viticulturists might consider when establishing vertically divided canopy systems is to plant vines closely enough that two trunks are together. This means that the pre-pruning machine can go around two trunks in one operation, rather than two separately. This will save the machine considerable time in withdrawal and reinsertion of the cutting mechanism.

When the vines are planted together we must use unilateral cordon training. I call this technique uneven vine spacing. It may have limitations for use with trunk-shaker harvesters.

For example, consider a vineyard with six-foot vine spacing in the row. The normal procedure would be to plant vines six feet apart, with each vine trained to bilateral cordons three feet long on each side of the trunk. With unilateral training, the vines are planted close together (within about six to nine inches of each other) and the trunks are trained together to the fruiting wire. Then cordons are trained in opposite directions. Each cordon will be six feet long. The space between trunks will be more than 11 feet.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I know many growers who believe that bilateral cordon training is a natural way for vines to be trained. However, this is not necessarily true. Vines do not need to be symmetrical. Anyone who thinks that should observe a wild vine growing up a tree!

Conclusion

One of the biggest advances I predict for the future of California viticulture will be more adoption of mechanical pruning. The machines we require are simple and inexpensive. Growers, get out there and talk to your engineers! ■

Dr. Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Australia. Contact him by e-mail: vinedoctor@compuserve.com. Read about Dr. Smart's business, including his consulting schedule, educational wine tours, and seminars, at his home page www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/838-6312 and www.vinquiry.com

Richard Smart joins Cal Poly College of Agriculture faculty

Richard Smart has joined the College of Agriculture at California State Polytechnic University (San Luis Obispo, CA) as its first Distinguished Visiting Professor of Wine & Viticulture with assignments to include both teaching and viticulture research.

Smart's appointment is ongoing: to teach in the spring quarter each year (mid-March to early June). His two courses will cover advanced vine physiology and growing quality wine grapes. He will contribute to graduate student research programs, conduct external industry seminars and workshops, and consult.

Cal Poly College of Agriculture Interim Dean David J. Wehner calls Smart's visiting professorship important to the California wine industry: "Richard's appointment will send a clear signal to California viticulture and to our students that Cal Poly intends to be a serious interactive partner in the industry, both regionally and statewide. Richard is a perfect fit. He exemplifies Cal Poly's 'learn by doing' philosophy."

Smart looks forward to his time at Cal Poly, which will signify his return to teaching and research. "I am absolutely delighted. I've long argued for more acknowledgement of the role vineyards and viticulturalists play in creating quality wine. Cal Poly, along with its growing emphasis on cool-climate viticulture, firmly believes in that concept and, like me, is interested in only one thing — results!"

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White Burgundy in America

CHALLENGES FACING *Chardonnay*

BY Brooks Painter

White Burgundy is generally recognized by wine critics and connoisseurs as the top white wine produced in the world. It is coveted and collected by critics, consumers, and New World winemakers who seek to understand its character and complexity.

Few California or other New World Chardonnays have achieved the stature of their counterparts in France. Indeed, as Chardonnay production has exploded outside of Europe, some New World producers have essentially made Chardonnay the equivalent of the "house" white wine.

What makes a New World Chardonnay that does achieve cult or "luxury" status special? Is it a wine only from certain appellations, or one that the winemaker carefully nurtures into the category? Why have no California American Viticultural Areas (AVA) emerged (comparable to the Mersault or Le Montrachet appellations in France) as ***the*** benchmark for Chardonnay?

Furthermore, how do winemakers, critics, and consumers define the flavor of a great Chardonnay? Do they usually agree? Is New World luxury Chardonnay a "world-class" performer in the same category as White Burgundy? Will it disappear as Chardonnay becomes more of an everyday global commodity?

Despite its strong sales performance over the years, Chardonnay has generally never achieved the stature and quality reputation of red wine varieties, such as Napa Valley Cabernet Sauvignon.

The challenge of elevating Chardonnay to meet the quality standards set by other varieties was the subject of the second in a series of four symposia in April 2001 on "Burgundy in America." The series is sponsored by Enologix®, a Sonoma, CA-based wine quality and flavor information company.

While many might argue that Bordeaux and Napa Valley Cabernet Sauvignon remain distinct from each other, they exhibit consistency in what Enologix President Leo McCloskey called "Benchmark Quality Metrics" in his introductory remarks kicking off the symposium. The same cannot be said when comparing White Burgundy with New World Chardonnay.

McCloskey suggested that there is a relatively uniform quality and pricing standard that is understood and consistent between Bordeaux and Cabernet Sauvignon that the consumer, wholesaler, retailer, winemaker, and national critics can generally agree upon. Such a standard, noted McCloskey, does not exist for New World Chardonnay.

This is not to say that there aren't a lot of high quality Chardonnays. Chardonnay is certainly a success in the marketplace; it is the financial engine that drives many California wineries. However, even for the top winemakers, producing the highest quality Chardonnay remains very much a challenge, particularly when trying to maintain quality as they scale up production.

A similar challenge exists for Cabernet Sauvignon, but for most high-end producers, the task doesn't seem quite as daunting. There are numerous examples of luxury California Cabernet wines (at $50 and even $100 or more per bottle) that are produced in volumes exceeding 40,000 cases, but not one example for Chardonnay. For many reasons, winemakers still find it more difficult to craft the finest Chardonnay than the finest red wines.

"As a winemaker," noted Larry Brooks, Enologix consulting Chardonnay winemaker, "I can offer several observations. First, advances in red wine quality have occurred primarily in the vineyard, and second, red wine quality comes 80% to 90% from the vineyard and only 10% to 20% from winemaking. The confounding issue with Chardonnay is that, in my opinion, quality comes roughly 50% from the vineyard and 50% from winemaking cellar practices or technique.

"Chardonnay grapes in the vineyard are resistant to analysis, so winemakers don't really have the luxury of assessing quality, in terms of flavor intensity, before the harvest. Therefore, for most winemakers, the vineyard work is nearly all retrospective, from late winter or early spring following the vintage, which is when I would argue that you can first see the quality of the vintage.

"With a better understanding of the basic character or style of Chardonnay, the winemaker can make informed decisions about winemaking practices. Wines that can be identified early as having greater intensity of flavor will benefit from added cellar practices and techniques."

Chardonnay as commodity: Old World vs. New

Speaker Michael Quinttus, Kobrand senior vice president (New York, NY), said White Burgundy (nearly always produced from Chardonnay grapes based upon particular *terroir* and appellations) and New World Chardonnays (often blended between very different sources) are distinct and not overlapping in the marketplace. Whereas the French produce luxury "farm-wines," the New World (Australia to California) largely produces "commodity-quality" wines from Chardonnay grapes.

"To understand the overall Chardonnay picture, we really should look at the global supply and demand factors and review worldwide production versus consumption," said Quinttus. "In terms of global statistics, wine consumption is projected to grow faster than production over the next five years.

"The problem, however, is that world production ***already exceeds*** world consumption — this gap

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between wine production and consumption, which we call the 'world surplus,' is currently 56.6 million hectoliters of wine, a serious problem representing approximately 629 million cases of wine! Chardonnay is a rapidly expanding portion of this surplus."

How did Chardonnay go from limited acreage and production to a global commodity? Quinttus outlined several industry trends that have contributed to Chardonnay's position in the market.

First, he cited historical wine laws and geographical models from Europe that restricted experimentation. "The European model is based on wines that were either of good quality and limited availability with designations that were a mystery to consumers or wines that were widely available but not very good or even miserable," said Quinttus. "For New World areas like California and Australia, there was a desire to depart from that kind of rigidity."

The second factor is the O.I.V.'s (Office International de la Vigne et du Vin) prohibition against the use of well-known generic wine descriptors outside their traditional European places of origin. This opened the door to unique New World concepts, allowing varietal Chardonnay to gain momentum.

Third is the nature of the varietal. Growers love Chardonnay because it's relatively easy to grow, and it produces high yields no matter the soils or climate zones.

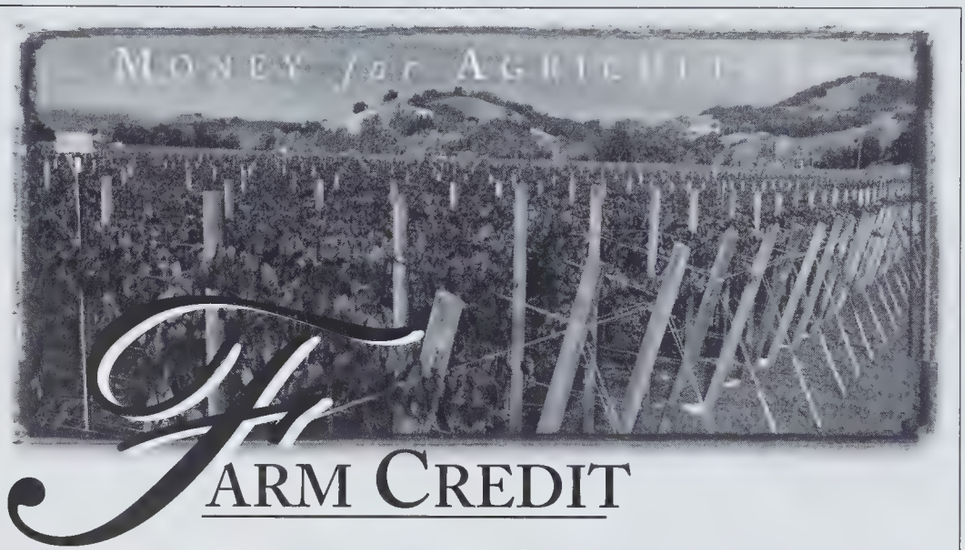
Fourth is the "permissive" U.S. 75% varietal labeling law, which requires that only 75% of the wine contents be from the varietal grape, thus inviting dilution with lesser quality grapes.

The final factor is the vast industry consolidation and globalization at all levels of production, distribution, and retail sales. "We now have a situation," according to Quinttus, "where three main producers (Constellation Brands, Gallo, and the Wine Group) account for over 60% of all California wine consumed in the U.S."

What does this mean for the wine industry?

The concern is that when a few large companies have all the market power, variety and selection are reduced. "Under classic business definitions," said Quinttus, "a commodity is any homogeneous item that may be freely bought and sold; a generic item that can be bought and sold virtually on quantity alone and with a convenient and expedient supply." Currently in the marketplace there is more homogeneity and standardization of product than ever, leading to more Chardonnay at the "commodity" level.

"Is commodity status for Chardonnay necessarily a bad thing?" asked Quinttus. Not for a large producer of wine with global marketing capability, he indicated. Consumers benefit from low prices, and wine's greater availabil-



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ity at affordable prices means opportunities to expand public interest in wine.

"However, if you have a weak brand," Quinttus added, "or are trying to raise price-points, or if you are a grower without a contract, you should be concerned about these trends, and realize that your market is now being opened up to competition from all parts of the world.

"The key in the future is going to be differentiating your product. Consider the Burgundy model — the antithesis of a commodity. Burgundy is comprised of five regions with over 2,000 vineyard designations, over 500 vineyards rated Premier Cru and 33 vineyards rated Grand Cru.

"Burgundy is not about the grape — it's about location. For Burgundian producers, this is an ideal way to differentiate their product, they are basically immune from the Chardonnay commodity phenomenon. By differentiating your product and effectively narrowing the competitive field, you reduce the commodity status in the marketplace for your wine. 'Points of difference' is something that every winemaker should be looking at; *terroir,* quality through low yields, and exceptional winemaking will create diversity."

Economics of Chardonnay

Backing up Quinttus's assessment that Chardonnay is now a global commodity, former Enologix economist Julia Davis argued that Chardonnay fits into a "perfectly competitive market."

"Such a market can be defined by three factors," Davis explained. "One, there are many sellers (many wineries producing and releasing Chardonnay wine to the market). Two, there are many buyers, and, three, it is a 'homogeneous product.' Because Chardonnay lacks obvious product differentiation it now fits that definition.

"Assuming that Chardonnay fits the 'perfectly competitive market model,' theoretical economists would not expect Chardonnay *quality* or *appellation* to be significant in determining price." This is similar to many other agricultural products.

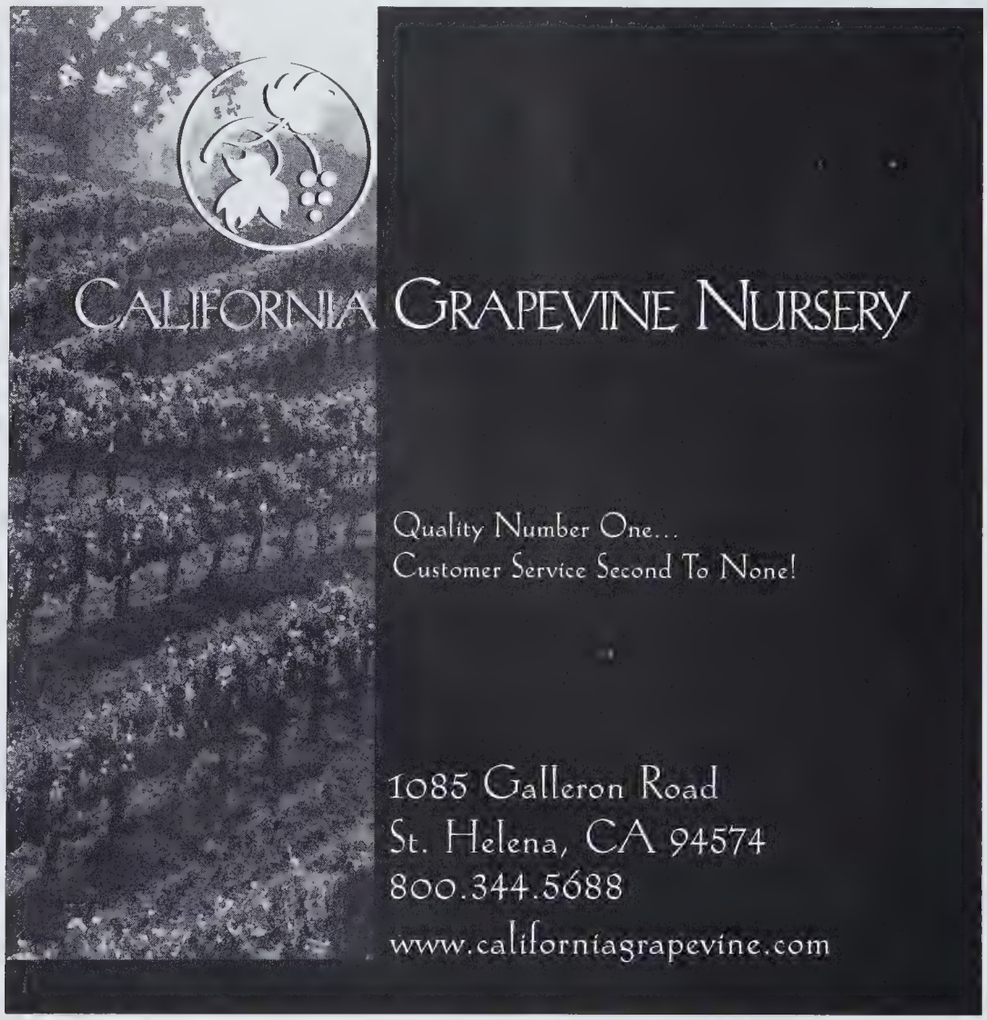
"For example," continued Davis, "most consumers cannot distinguish between the taste of ketchups on the market, but when asked which brand they recognize they quickly identify one or two major brands. In other words, these producers have created 'brand recognition' and, as a result, are able to charge a premium for their products."

Davis used a graphic representation of the Enologix analyses data for essential oils (aroma) and yellow pigments (color) to show the similarities in style of 300 Chardonnays from the 2000 vintage. "These Enologix Styles-Maps have been generated to show stylistic color, flavor, and fragrance," she noted. "The great majority of the New World wines are clustered in one region of the graph, as distinct from the White Burgundies. This means that stylistically [according to Enologix], the New World wines are very similar. While they may show some differences they do not express a dramatically different range and thus, by the Enologix assessment, taste very much the same."

Davis then investigated whether the data support the assumptions for the "perfectly competitive market model." As she expected, when considering all New World Chardonnays in the group, variations in quality, case volume ("scarcity"), and appellation were insignificant.

Davis then divided the data according to appellation and examined whether any appellations showed a link between production volume, critics' scores or quality, and price. Only in a few AVAs (such as Los Carneros) is case production significant in determining price, Davis claimed. In most other California AVAs, volume is not a significant factor. National critics' ratings, however, are a significant variable in determining price.

"This again supports the argument that New World Chardonnay is considered a 'homogeneous commodity' (no matter what the growing region or winemaking)," added Davis. "Critics' ratings are the only factor that separate New World Chardonnay wines with a higher price point from the rest of the market."



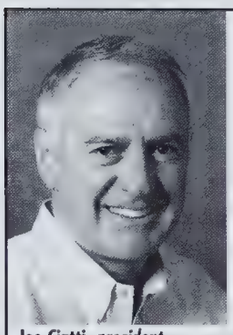
The main difference between California Chardonnay and White Burgundy is the intensity of flavor, in particular, the higher level of fragrance in White Burgundy. Globally, the Enologix quality index has a very high correlation with critics' scores. The low levels of fragrance intensity typical in New World Chardonnay means that quality is all very similar. However, when a critic identifies a particular wine and gives it a higher score, then the producer is able to charge a higher price for the product." (See Jeff Morgan's comments below on insights into critics' scoring patterns).

Nature vs. Nurture

Winemaker David Ramey (Ramey Wine Cellars and Rudd Winery, Oakville, CA) preferred to focus on "luxury" rather than "commodity" Chardonnay. "The previous speakers painted a provocative picture," he said. "Yet, as Mark Twain once said, 'There are lies, damn lies, and statistics.'

"I find it hard to believe that there is little correlation between quality and price. Are the critics' scores based upon anything *other* than quality?"

In Ramey's opinion, wines selling for $50 or more should be considered "Luxury Chardonnay." "This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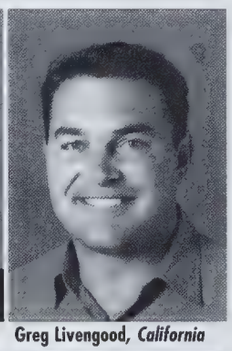
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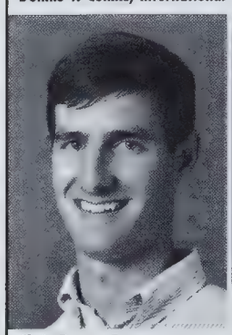
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should also be a sustainable price, with a proven track record that has come to equilibrium in the marketplace," he said. "In my view, one of the key elements of luxury Chardonnay is site specificity. One reason varietal labeling has been so popular for New World wine is because winemakers are only now discovering proper varietal choices for specific *terroir*.

"For luxury Chardonnay, these appellations provide an additional guarantee of quality to the consumer. Price viability relies on both site specificity and brand recognition. In order to be considered luxury, the wine must be produced from an appellation that is recognized for that specific variety.

"Of course, brand is another key factor that supports a high price-point for luxury Chardonnay. Price is related to the perceived value of the brand."

Scarcity is another contributing factor with luxury pricing, according to Ramey. "Producers trying to play in the upper end have to be shrewd and not over-produce." The current Chardonnay sales of Ramey Wine Cellars are 2,000 cases per year.

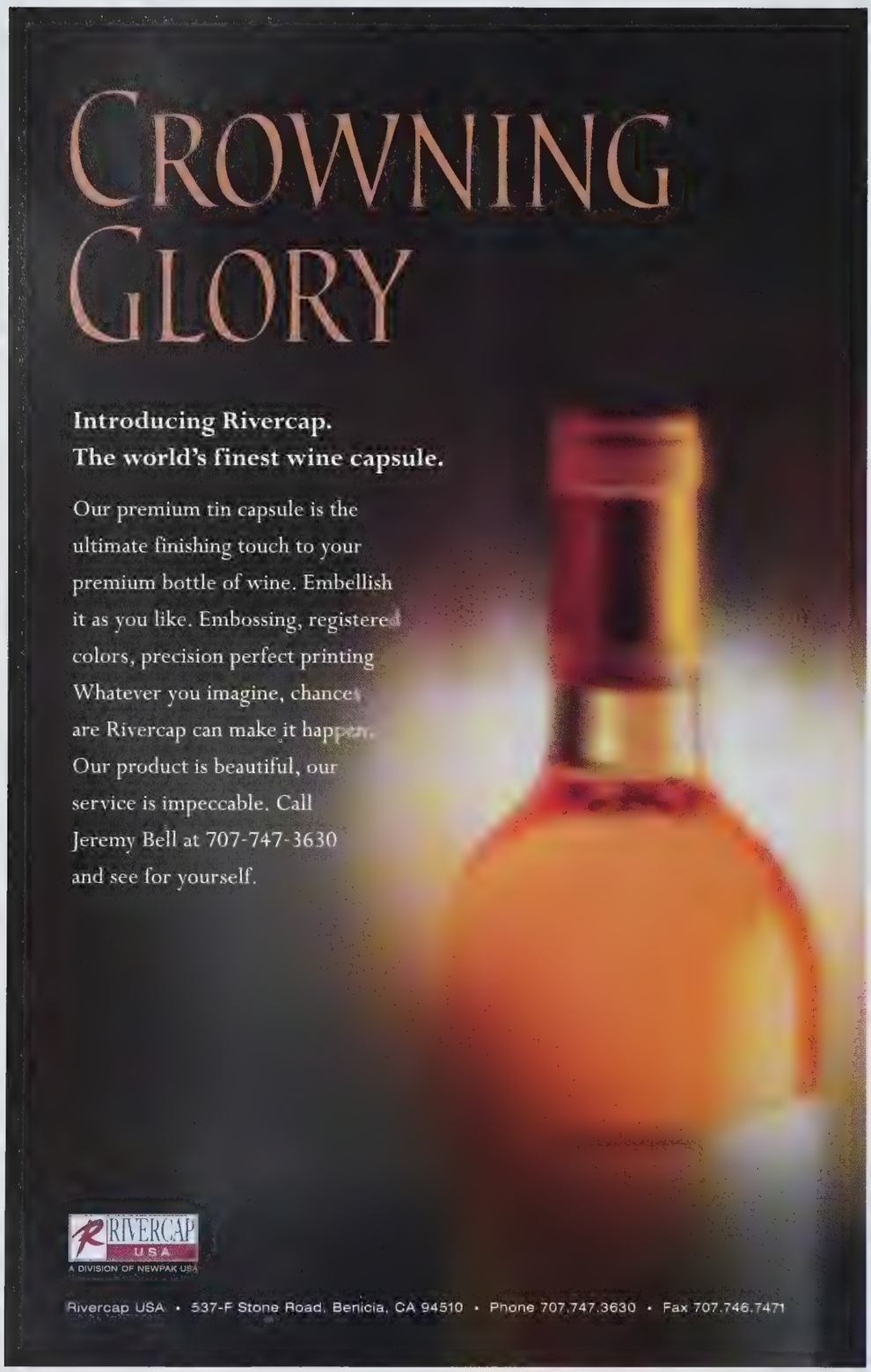
The quality-terroir relationship

Byron Kosuge, former winemaker at Saintsbury (Napa, CA), discussed site specificity from a producer's perspective. Kosuge shared insights into Saintsbury's established reputation for producing excellent Chardonnay since the 1980s, and how it achieved its status as one of the few California producers who has achieved quality similar to the Burgundian model.

"California Chardonnay producers, for the most part, have not paid enough attention to *terroir*." Kosuge said. "*Terroir* or site specificity or whatever you want to call it means, in my mind, not only *where* you grow but also *how* you grow the grapes. Part of the problem is that Chardonnay does fairly well in a wide variety of places, but I think it only really shines in a few, and we haven't found all of them yet.

"Certainly there have been many vineyard-designated Chardonnays, but we, as an industry, have tended to overlook site specificity in favor of winemaking. This is changing, but if winemakers are to be serious about escaping commodity status for their wines, they better start putting site, and all it implies, at the top of the list."

Kosuge emphasized his belief that reliance on winemaking alone will not allow producers to shift from commodity to luxury Chardonnay. "Any winemaker knows that where we plant and how we farm Chardonnay is critically important, but we don't always put that into practice. It can be as simple as identifying which parts of a vineyard mature together, and farming accordingly. Maximizing the potential of your site really just comes down to attention to detail. It's only with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that attentiveness that you can focus on expression of the site."

White Burgundy idolatry

Ted Lemon, owner/winemaker of Littorai Winery (St. Helena, CA), examined what he called the Burgundian model and compared it to California. "Most of the high-end Burgundy producers are making very small lots from several different appellation sources," says Lemon. "These same producers engage in an ongoing effort to reposition their production away from the more generic, more common appellations, such as Bourgogne, should they be present in their brand portfolio."

Lemon sketched a picture of an average producer of White Burgundy: "In Burgundy, the owner is often the vineyard manager, winemaker, and marketing director. He is someone with a global sense of his wine production and a good understanding of his clientele. In many cases, he has to answer only to himself and not worry about a quarterly or semiannual corporate report, or a winery owner who may have been successful in another walk of life and might have unrealistic expectations about the wine business."

According to Lemon, since the winemaker is the owner, "there is very little turnover. In contrast, many California winemakers move to another winery every few years."

What can we learn about luxury Chardonnay from the Burgundy model? "Our goal as luxury Chardonnay producers," said Lemon, "should be to do everything we can to make our products individual, and to emphasize the human dimension of our wines and our own unique story."

Create a good story

Speaker Jeff Morgan, consulting wine director at Dean & Deluca (St. Helena, CA), has an insider's knowledge of the practices and preferences of the national wine critics. He explained his perspective on how to get noticed and receive favorable reviews.

"Great California 'Chard' — it's big and it's bold," said Morgan. "This is the California style and *terroir,* and that is what California winemakers need to subscribe to. If you can't deliver this style maybe you should consider budding over, or planting another varietal."

This simplified view of California Chardonnay may not be far from the mark. Most of the smaller high-end producers in California are now making wines that are big and full-flavored, with a lot of new oak. These Chardonnays are often fermented with native yeast without filtration (and sometimes cloudy with sediment). "If it's not fermented with native yeast, perhaps it should at least *taste* like native yeast," chuckled Morgan. "Great California Chardonnay is complex, rich and inter-

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esting, and shows lush fruit with a round, fat, and supple palette.

"While there are a few so-called 'lightweight' Chardonnays that do fall in the luxury category, it took many of them 15 to 20 years to develop their story and position." The majority of producers today are making wines from what Morgan referred to as "ultra ripe fruit." "It's not about food wines — it's about tasting wines," noted Morgan. "This is the *essence* of the business right now.

"A big, heavy bottle can be useful. At a blind tasting people can feel the weight of the bottle. You might laugh and think it's sick, but it's true! That's the way it is with most people, even the major critics.

The "*Terroir*-centric" winemakers in the crowd were surprised by Morgan's perspective on the unimportance of appellation. In his opinion, appellation means very little in the luxury Chardonnay market unless you are from one of a handful of special California viticultural areas. "Napa Valley, for example, commands a 20% to 30% premium above other viticultural areas," he said. "The other most important viticultural areas are Russian River Valley, Carneros, and the Sonoma Coast and Central Coast."

What about packaging? Consumers see many beautiful labels in the market. "In my opinion it's a complete waste of money — nobody cares what the label looks like," commented Morgan. "Labels matter at the lower end of the market where you're trying to attract impulse buyers, but for luxury Chardonnay it just doesn't matter as much. Consumers at this level are buying the brand and not the label."

Morgan echoed Lemon's perspective on the importance of the human dimension. "The most valuable selling points are the winemaker's name or the winery name," he added. "In California, our wine industry doesn't have a Burgundian paradigm — we don't have generations and generations of winegrowers. This is why it is very important for winemakers to have a story. A good producer can draw people in with his or her story, and then let the critics and consumers take their time to love their wine. Winemakers must express their own personality, and that has got to be a major part of their story."

A progressive view?

"One could draw rough parallels currently between Bordeaux and high-end Cabernet Sauvignon in California, but a similar parallel does not exist for Burgundy and Chardonnay in California," said Leo McCloskey. "The progressive view would be that Californians *can* do this — that there is a group of wine producers from a specific viticultural area who will stand out and rise to set a Chardonnay benchmark for the industry.

"Chardonnay wine quality has not increased since sometime in the early 1990s for most wineries. Red wine quality and methods have continued to increase in quality (and quantity) while truly great white wine quality has stagnated. For example, Napa Valley Cabernet Sauvignon has clearly increased in quality (with some producers making 30,000 to 40,000 cases per year at above $100 per bottle retail prices) as a result of very specific changes in viticulture and wine processing."

The same cannot be said for Chardonnay, according to McCloskey. The largest percent increase in Chardonnay wine quality has actually occurred with very large producers, according to Enologix research. Gallo of Sonoma's Chardonnay provides one clear case in point in today's market. Gallo can scale production for Chardonnay and make a 90-point wine at $9 to $12 per bottle.

This apparent dramatic increase in quality at the low end of the market demonstrates what many of the panelists said. Chardonnay is easy to produce as a "commodity" product. The key question is: How does one craft a truly great California Chardonnay and then scale this luxury product into a really successful sales effort?

The time may have come to improve upon the *sur lies* method (the ageing of white wine on the yeast sediment in the barrel), suggested McCloskey: "The *sur lies* method has some limitations, and reproducibility

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of the technique is very low. It is very difficult for California winemakers to achieve the same level of flavor intensity year after year.

"In general, flavor intensity drives recognition of *terroir,* and viticultural areas that are recognized for the quality of their *terroir* will have an advantage over lesser appellations. Appropriate winemaking methods *enhance* those regional differences and add distinction and quality to the wine.

"Yeasts are truly independent of the winemaker, of the grapes, and of the vintage. As such, they are out of the winemaker's control. However, with the *sur lies* method, the month the flavor is released from the yeasts is different in every winery in every year. But with the right information, one could capture quality enhancements from the yeast in the month it peaked, and thereby cut costs and increase winery profits.

"The other variable that is very much in the control of the winegrower is vineyard yields. I believe that, by controlling yields in the vineyards, California could increase the flavor intensity of its Chardonnay.

"Should we accept Burgundy as a benchmark by which we judge New World Chardonnay? The French have certainly set the standards for price and quality in the global Chardonnay (White Burgundy) market.

"However, California Chardonnay has a lot going for it — a richer mouthfeel, forward fruit, slightly higher alcohol — we are already taking advantage of that and creating our own style. By utilizing these two key quality factors, that is, controlling yield in the vineyard and fine-tuning the *sur lies* method in the winery, winemakers could make dramatic and consistent quality improvements to their wines."

Conclusion

Is it true (as Leo McCloskey suggests) that an agreed upon, relatively uniform quality and pricing standard that is understood and consistent between the consumer, wholesaler, retailer, winemaker, and national critics does not exist for New World Chardonnay? Are many of the New World Chardonnays that receive accolades from the national critics simply loaded with stylistic nuances (wild yeast, sediment, sulfides, a "heavy bottle" etc.) rather than "flavor intensity"?

If, as Larry Brooks says, Chardonnay quality comes roughly 50% from the vineyard and 50% from winemaking, cellar practices or technique, why should we put even more effort, as Byron Kosuge suggests, into focusing on *terroir* and site selection for Chardonnay vineyards? Is Brooks' opinion on the unimportance of vineyard site (relative to red wine production) simply because, as Ramey claims, New World winemakers are only now discovering proper varietal choices for specific *terroir*?"

Julia Davis's opinions about New World Chardonnay wines being stylistically very similar and tasting much the same are actually consistent with both Brooks's assessment that site and appellation play a minor role, and the opinion of Ramey and Kosuge that the emphasis and importance of site is not yet understood.

Michael Quinttus's opinion that Burgundy produces luxury farm-wines while the New World (Australia to California), largely produces commodity-quality wines from Chardonnay grapes also would indicate that, in general, the New World has not yet focused on making Chardonnay in the vineyard.

McCloskey says that since luxury Chardonnay has yet to be successfully scaled up in production as has Cabernet Sauvignon (the New World's first and only "truly global success story," according to him), Chardonnay has not yet met its potential in the New World.

At the same time, Ramey suggests "scarcity" is critical to luxury pricing. Is it possible to break the "limited production" barrier and sell a high-end Chardonnay on quality alone?

With many New World winemakers often many miles (sometimes hundreds) away from the vineyards, and changing jobs every few years, is it reasonable to think, as Ted Lemon notes, that the New World can adopt the Burgundy model

(where the owner is the vineyard manager, winemaker, marketing director, and chief bottle washer) while scaling production? Not likely.

Then there are critical style issues to consider. Does all successful California Chardonnay have to be "big and bold," as Jeff Morgan claims? If it's "not about food wines, only about tasting wines," can winemakers, by focusing on controlling yields in the vineyard and fine-tuning the *sur lies* method in the winery, ultimately make more flavorful food wines with finesse and elegance rather than making "alcoholic monsters"?

Chardonnay has played a giant role in the current popularity and acceptance of wine in many consumers' daily lives. If individual wineries and the wine industry as a whole are to continue growing, producers must continue to increase daily consumption by consumers sitting down to their regular meal. Thus, "food wines" must play a critical role in the future.

By evaluating issues such as those raised here, and moving forward to increase quality both at the commodity and luxury level, the wine industry could continue winning over new consumers while offering spectacular wines to the connoisseur. ■

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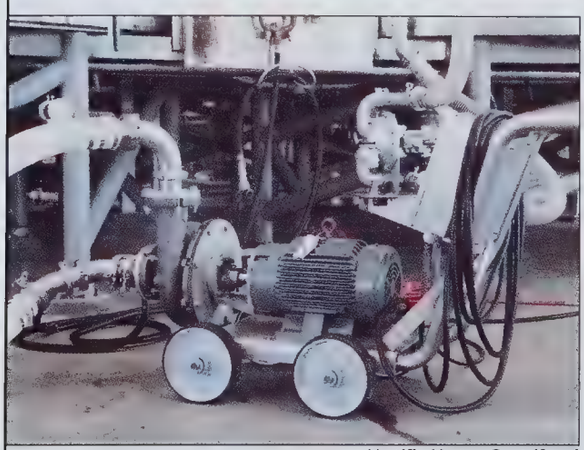
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Importance of **soil texture** to vineyard management

BY Thomas J. Rice, Ph.D.
Soil Science Department,
California Polytechnic State University,
San Luis Obispo, CA

Natural soils are comprised of soil particles that vary in size. Soil scientists categorize particle-size groups, called "soil separates," as follows: sands (the coarsest); silts; and clays (the smallest/finest).

What is soil texture?

Soil texture refers to the weight proportion (relative proportion by weight percentage of sand, silt, and clay) of the mineral soil separates for particles less than two millimeters (mm) as determined from a laboratory particle-size distribution. Texture is soil's most important physical property for grape-growing, since it influences water holding capacity, root growth, and overall vine vigor.

The terminology used to describe soil texture in the popular press often does not adhere to standard definitions. Therefore, much confusion and outright misinformation is spread about this vineyard soil property.

The purpose of this text is to present standardized definitions for soil texture terms and to discuss the importance of soil texture to vineyard management.

Soil separate sizes

The U.S. Department of Agriculture (USDA) has established limits of variation for the soil separates and has assigned a name to each size class (Table I). This system has been approved by the Soil Science Society of America (SSSA), and is the one used in all published USDA soil survey reports. Most of the pertinent USDA publications regarding soil survey standards and soil texture terms can be accessed from the USDA web page cited in the references section below. Other standard soil science terminology can also be referenced by examining the Glossary of Soil Science Terms linked to the SSSA web page (SSSA, 2001).

USDA soil textural classes

The texture classes are shown on the USDA textural triangle (Figure I).

Subclasses of sand are subdivided into coarse sand, sand, fine sand, and very fine sand. Subclasses of loamy sands and sandy loams that are based on sand size are named similarly. Detailed definitions for the many different subclasses of sands, loamy sands, and sandy loams are found in the USDA soil survey manual (Soil Survey Division Staff, 1993).

The textural triangle is used to resolve problems related to the detailed word definitions. The eight subclasses in the sand and loamy sand groups provide refinement greater than can be consistently determined by field techniques. Only those textural distinctions that are significant both to agricultural use and management, and which can be consistently made in the field, are commonly applied.

Groupings of soil texture classes

It is often convenient to speak of general texture groups. The general soil texture groups, in three (sandy, loamy or clayey) or five classes, are outlined in Table II. In some areas where soils are high in silt, a fourth general class, silty soils, may be used for silt and silt loam.

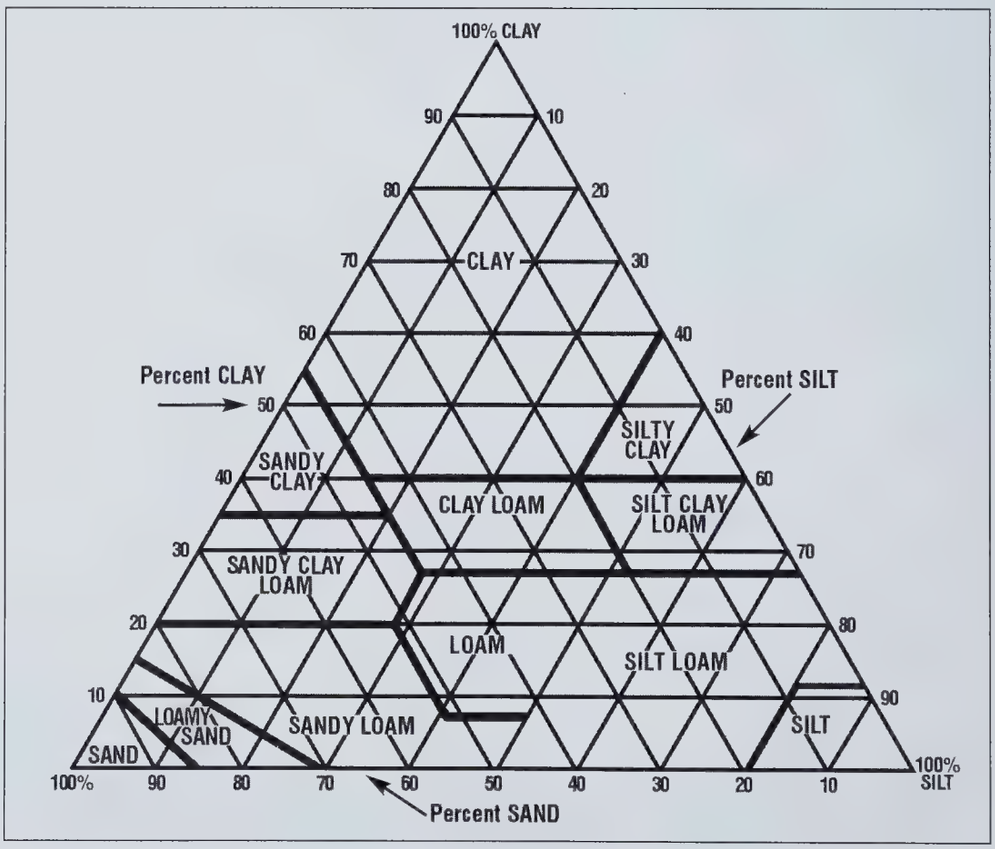

Figure I: USDA textural triangle helps clarify the correct definitions for soil texture subclasses.

Determination of soil texture

Apparent field texture is a tactile evaluation only, with no inference as to laboratory test results. Field estimates of soil texture should be rechecked with laboratory testing when detailed data are needed, and the field criteria should be adjusted as necessary. Sand particles feel gritty and can be seen individually with the naked eye. Silt particles cannot be seen individually without magnification; whether dry or wet, they have a smooth feel on the fingers.

Clay soils range from slightly sticky to very sticky when wet. This is because soil texture and soil clay mineralogy are not directly related. Soils dominated by swelling and cracking clays are more sticky and more plastic (referring to the ability of wet soil to form a ribbon or putty ball when it is manipulated) than soils that contain similar amounts of micaceous (high in muscovite or biotite mica) or kaolinitic (non-swelling) clays.

Soil texture and soil organic matter content are also not directly related. In fact, to determine soil texture using standard USDA methods, the organic matter and all other soil aggregating agents (like calcium carbonate, silica, and iron oxides) are chemically removed from the total soil sample prior to the determination of soil texture. Therefore, standard soil texture methods call for removal of these most chemically important soil components. This fact makes it critical to look at the soil chemical properties like pH, organic matter content, and plant available nutrients — in addition to the soil texture — in order to make wise viticultural management decisions.

Table I: Soil separates and their diameter ranges

Soil Separate		Diameter (mm)	Visual Size Comparison of Maximum Size
Sand		**2.00 to 0.05**	
	Very coarse	2.00 to 1.00	House key thickness
	Coarse	1.00 to 0.50	Small pinhead
	Medium	0.50 to 0.25	Sugar or salt crystals
	Fine	0.25 to 0.10	Thickness of book page
	Very fine	0.10 to 0.05	Invisible to naked eye
Silt		**0.05 to 0.002**	Visible under light microscope
	Coarse	0.05 to 0.002	
	Medium	0.02 to 0.005	
	Fine	0.005 to 0.002	
Clay		**<0.002**	Visible with an electron microscope
	Coarse	0.002 to 0.0002	
	Fine	<0.0002	

Table II: General soil texture groups

General texture group terms	Texture classes
Sandy soil materials:	
Coarse-textured	Sands (coarse sand, sand, fine sand, very fine sand). Loamy sands (loamy coarse sand, loamy sand, loamy fine sand, and loamy very fine sand.)
Loamy soil materials:	
Moderately coarse-textured	Coarse sandy loam, sandy loam, fine sandy loam.
Medium-textured	Very fine sandy loam, loam, silt loam, silt.
Moderately fine-textured	Clay loam, sandy clay loam, silty clay loam.
Clayey soils:	
Fine-textured	Sandy clay, silty clay, clay

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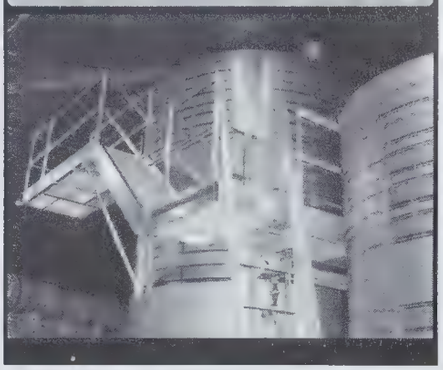

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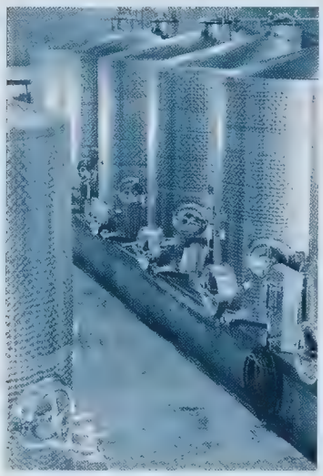

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Many analytical labs will determine the soil saturation percentage (such as the amount of water, by weight, in a saturated soil sample) and make indirect soil texture determinations from this value (Table III). Generally, the higher the saturation percentage, the higher total soil clay and organic matter contents. The saturation percentage is directly related to the total soil porosity and total soil water-holding capacity and, therefore, is a valuable number to use for irrigation system design.

Surface cracks formed by drying of swelling clays.

Rock fragments

Rock fragments are unattached pieces of rock, 2 mm or larger in diameter, that are hard or strongly cemented. They are physically removed (by sieving) from the soil separates in the laboratory determination of soil texture. Then, volume and weight measurements are performed to determine their amounts in soil.

Rock fragments are described by size, shape, and, in some cases, the type of rock. If one size or range of sizes predominates in a soil, the textural class is modified using additional information. For example, compound terms like "fine pebbles," "cobbles, 100 to 150 mm in diameter," "channers, 25 to 50 mm in length" may be used.

Gravel is a collection of pebbles that have diameters ranging from 2 to 75 mm. The term is applied to the collection of pebbles in a soil layer with no implication of geologic rock type. The terms "pebble" and "cobble" are usually restricted to rounded or subrounded fragments; however, they can

Table III: Saturation percentage and approximate soil texture classes

Soil saturation percentage	Approximate soil texture classes
Below 20	Sand or Loamy Sand
20 – 35	Sandy Loam
35 – 50	Loam or Silt Loam
50 – 65	Clay Loam
65 – 150	Clay
Above 150	Usually organic soils (peat or muck)

Table IV: Terms to describe rock fragments in soils

Shape* and size	Noun	Adjective
Spherical, cubelike, or equiaxial:		
2–75 mm diameter	Gravel (pebbles)	Gravelly
2–5 mm diameter		Fine gravelly
5–20 mm diameter		Medium gravelly
20–75 mm diameter		Coarse gravelly
75–250 mm diameter	Cobbles	Cobbly
250–600 mm diameter	Stones	Stony
>600 mm diameter	Boulders	Bouldery
Flat:		
2–150 mm long	Channers	Channery
150–380 mm long	Flagstones	Flaggy
380–600 mm long	Stones	Stony
>600 mm long	Boulders	Bouldery

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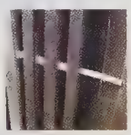

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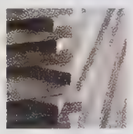

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Table V: Generalized influence of soil separates on other soil properties and behavior

Property/behavior	Sand	Silt	Clay
Water-holding capacity	Low	Medium to High	High
Aeration, when moist	Good	Medium	Medium to poor
Hydraulic (water) conductivity	High	Slow to Medium	Slow to very slow
Soil organic matter level	Low	Medium to High	High to Medium
Decomposition of organic matter	Rapid	Medium	Slow
Warm-up in spring	Rapid	Moderate	Slow
Compactability	Low	Medium	High
Susceptibility to wind erosion	Moderate (high if fine sand)	High	Low
Susceptibility to water erosion	Low (unless fine sand)	High	Low if aggregated, High if not
Shrink-swell potential	Very low	Low	Moderate to very high
Sealing of ponds and dams	Poor	Poor	Good
Suitability for tillage when wet	Good	Medium	Poor
Pollutant leaching potential	High	Medium	Low (unless cracked)
Cation exchange capacity (CEC)	Low	Medium	High
Resistance to pH change	Low	Medium	High

be used to describe angular fragments if they are not flat.

Words like granite, limestone, and shale refer to a rock type, not a rock fragment. Composition of the fragments can be described as follows: "granite pebbles," "limestone channers" and "shale gravels."

In USDA soil survey reports, the adjective describing rock fragments in soils is used as the first part of the textural class name according to the following conventions:

- Less than 15% by volume — No mention of rock fragments is used.
- 15% to 35% by volume — The dominant kind of rock fragment is used (such as "gravelly loam," or "cobbly clay loam").
- 35% to 60% by volume — The word "very" precedes the name of the dominant kind of rock fragments (such as "very cobbly loam," or "very cobbly sandy loam").
- More than 60% by volume — Add the word "extremely" in front of the

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Harvest Bins

Although interchangeable with Valley bins from other manufacturers, Western Square's two-ton bin has features which have earned it the reputation for the best designed bin in the industry.

The D-ring end is ribbed so that the stress from lifting a full bin is distributed over the entire height of the bin, not just the D-ring itself.

Side walls, end walls and bottom sections are lapped, so that welds are on flat surfaces, not on edges or corners.

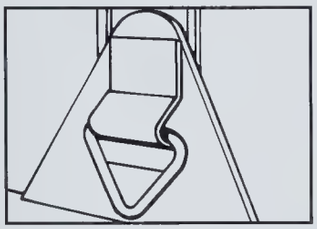
The top rail is formed to provide excellent rigidity and dimensional stability. The channel on the outside of the rail is blocked to prevent the hooks of the gambrel from catching.

These features give Western Square's two-ton bin the strength and dimensional stability needed for years of trouble-free use, but without added weight. Western Square's bin weighs only 435 pounds. The outside dimensions are 8' x 4' x 4'.

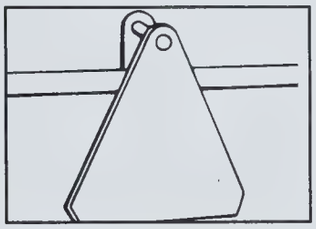
Western Square is the only manufacturer to use powder coating (baked enamel) to coat steel bins. The inside coating of the bins is FDA-approved food grade epoxy powder coating in a choice of white or gray. The outside coating is exterior grade polyester powder coating which is available in several colors.

Also available in stainless steel.

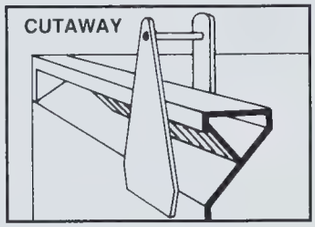
Forged D-Ring (rated at 20,000psi) mounted on ribs, spreads the stress of hoisting over a maximum area.



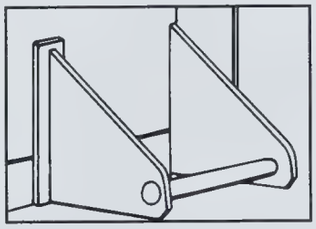
Lifting pins and pivot pins welded to triangular shaped plates for maximum strength.

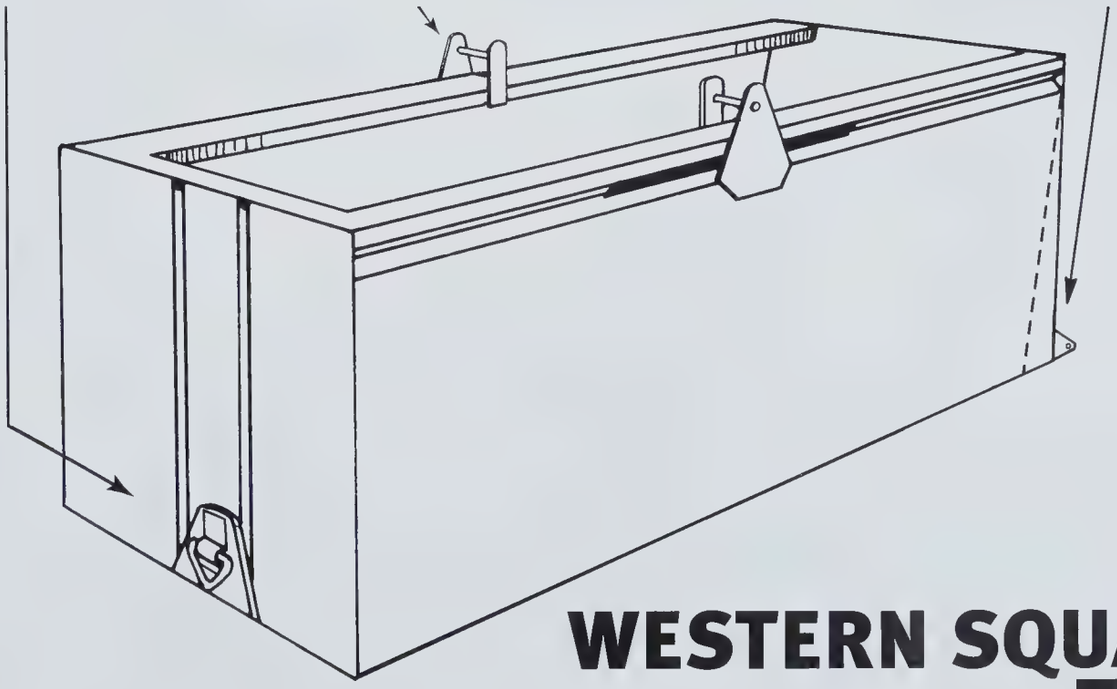


Sides of bin made with roll-formed steel. No weld required on inside. Smooth surface for best grape release.



"Thru-holes" design. Pins welded on both sides of each plate. (Not butt-welded).





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coarse fragment name (such as "extremely gravelly loam," or "extremely cobbly clay loam").

• If there are too few soil separates present to determine the soil textural class (less than 10% by volume), terms such as "gravel," "cobbles," "stones," or "boulders" are used, as appropriate, without mention of the textural class.

Soils generally contain rock fragments smaller or larger than those identified by the adjective term. The "rock fragment" adjective applies to the most predominant rock fragment size found within any soil layer. For example, on a volume basis, a stony loam with 20% stones may also contain 10% gravel-sized pebbles, but "gravelly" is not mentioned in the name. In this case, stones are the most abundant rock fragment size and "stony" is used as the adjective.

More precise estimates of the quantity of rock fragments than are provided by the defined classes are needed for some purposes as potential erosion prediction and determination of soil water holding capacity. If more precise information is needed for specific land use purposes, estimates of percentages of each size class or combination of size classes are included in the description: such as "very cobbly loam;" "30% cobbles and 15% gravel" or "silt loam; about 10% gravel."

If rock fragments are significant in soil vineyard management, they are the basis for designing and describing new soil map units which are identified on vineyard soil maps. In contrast, bedrock exposed at the earth's surface is not soil and is separately identified on soil maps.

The volume occupied by individual rock fragments can be seen in the field, and aggregate volume percentage can be estimated. Rock fragment volume percentage may be converted to a weight percentage, using USDA conversion tables or direct laboratory measurements.

Influence of soil texture on other soil properties

As discussed above, individual soil mineral particle diameters range over six orders of magnitude, from boulders (≥600 mm) to clays (less than 10^{-9} mm) which can only be seen with an electron microscope. The soil textural classification established by the USDA is used for agricultural soils. The size ranges for these separates are not purely arbitrary, but reflect major changes in how the particles behave and in the physical properties they impart to soils (Table V).

Texture is an important soil characteristic because it will, in part, determine water intake rates (infiltration); water movement through soil (hydraulic conductivity); soil water holding capacity; the ease of tilling the soil; and the amount of aeration (which is vital to root growth).

Continued on page 67

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Saving a heritage clone

BY Eleanor & Ray Heald
Contributing editors

Not all "clones" are clones. That's only the first of many advisories Deborah Golino, Ph.D., director of the University of California Davis (UCD) Foundation Plant Materials Service (FPMS) offers. Although clones are at the forefront of current viticultural interests, Golino, a leading global expert on the subject, carefully measures her use of the term.

Rafael Rodriguez, retired Neibaum-Coppola vineyard manager and historian, began taking Golino's advice in 1989. That's when the project to save the Niebaum-Coppola heritage clone of Cabernet Sauvignon, first planted on the property between 1882 and 1885, began.

The winery has historical records dating the planting origin of its Cabernet Sauvignon to the 1880s. "To the best of our knowledge," recalls Niebaum-Coppola winemaker Scott McLeod, "The original Cabernet Sauvignon block that Captain Niebaum planted was in 1882. Since then, that block has been the source of all subsequent plantings on the estate."

In 1989, Golino and Rodriguez selected old vines on the property from the original plantings that best represented the character of the old vineyard. Wood was collected and taken to UC Davis for disease testing, shoot tip culture therapy, and creation of new selections of Cabernet Sauvignon.

However, this is a slow process requiring many years before new planting material is available. When winemaker McLeod joined Niebaum-Coppola in 1992, he started a "fast track" program for the old vines as well, using laboratory testing by Agri-Analysis, a diagnostic company based in Davis, CA.

European standards are very high for the creation and release of a new clone, Golino explains. Most of the California plant materials would not qualify by their standards.

"They believe that decades of replicated study all the way through winemaking are required before one can even talk about having a clone. They'd laugh at calling the Niebaum-Coppola Heritage Cabernet Sauvignon a clone because we have not yet compared it, in a scientific way, to other Cabernet Sauvignon clones and described its characteristics.

"From an international perspective, it's best for Californians to remember the tremendous differences in the use of the word clone. Until more work has been done with newly collected materials, we often use the term heritage selection rather than clone.

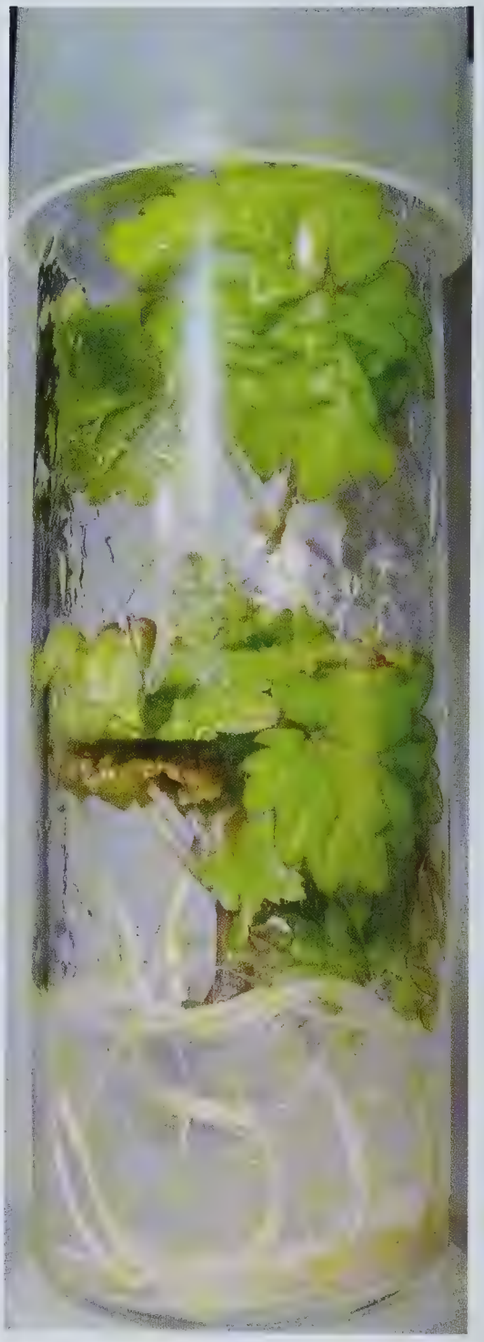
"Many vineyard owners believe that they have a clone because they make a unique, quality wine. Often, however, the selection in their vineyards is genetically identical to other selections. It is their site that is different. Subtle aspects of soil, climate, and culture add up to a unique fruit character.

"Clones take evolutionary time to develop. If vines have been planted for only 15 or 20 years, some growers will actually refer to the vines in that site as a clone and give it a name. They believe they have a clone when they don't."

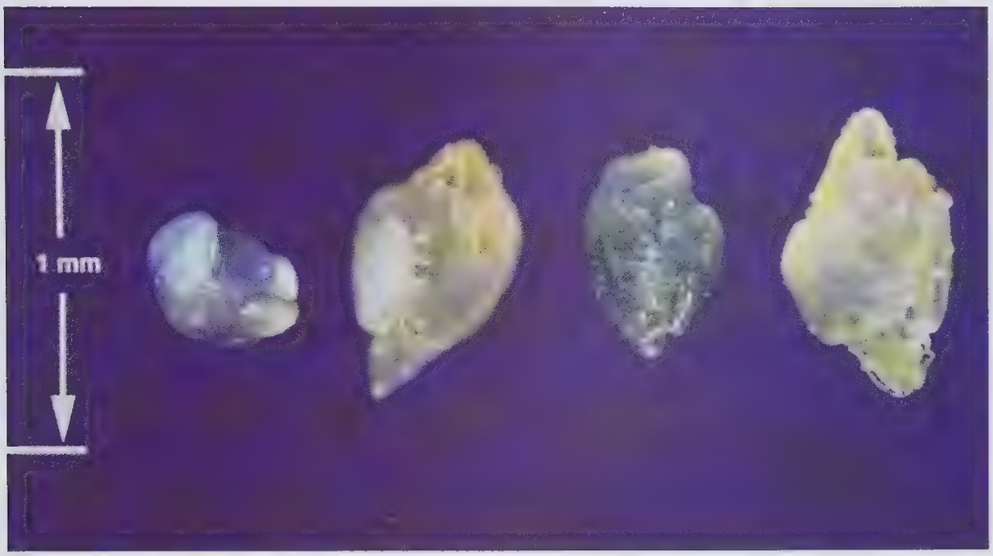
Send in the clones

The original Niebaum-Coppola material is more correctly called a "massale selection." It is likely a mix of genetic material that came to the property from dormant cuttings brought to California from Europe by property founder Gustav Niebaum.

"There's a lot of argument," Golino continues, "about how different a vine needs to be in order to use the term clone but the safest way, and the way we have worked with the Niebaum-Coppola heritage material, is to treat each vine as if it could be different, test



This Cabernet Franc vine is ready to be transplanted out of tissue culture into soil.



Shoot tips less than 0.5 mm are used to regenerate healthy grapevines from virus-infected source materials.

it separately, and treat it as an individual, potentially new clone."

"The French," Golino notes, "would take 15 to 20 years to evaluate the Niebaum-Coppola Cabernet Sauvignon selection before making a public release. We just can't do things like that. This is America. Our industry works at a much faster pace.

"Using the criterion that the Niebaum-Coppola selection has a clear history back to the late 19th century, that it has been made into wine on that particular estate for almost 120 years, and has been continuously replanted to that original selection, it qualifies as a unique massale selection of Cabernet Sauvignon. The new selections that have been propagated from the massale selection are true clones in a technical sense, derived from a single vine."

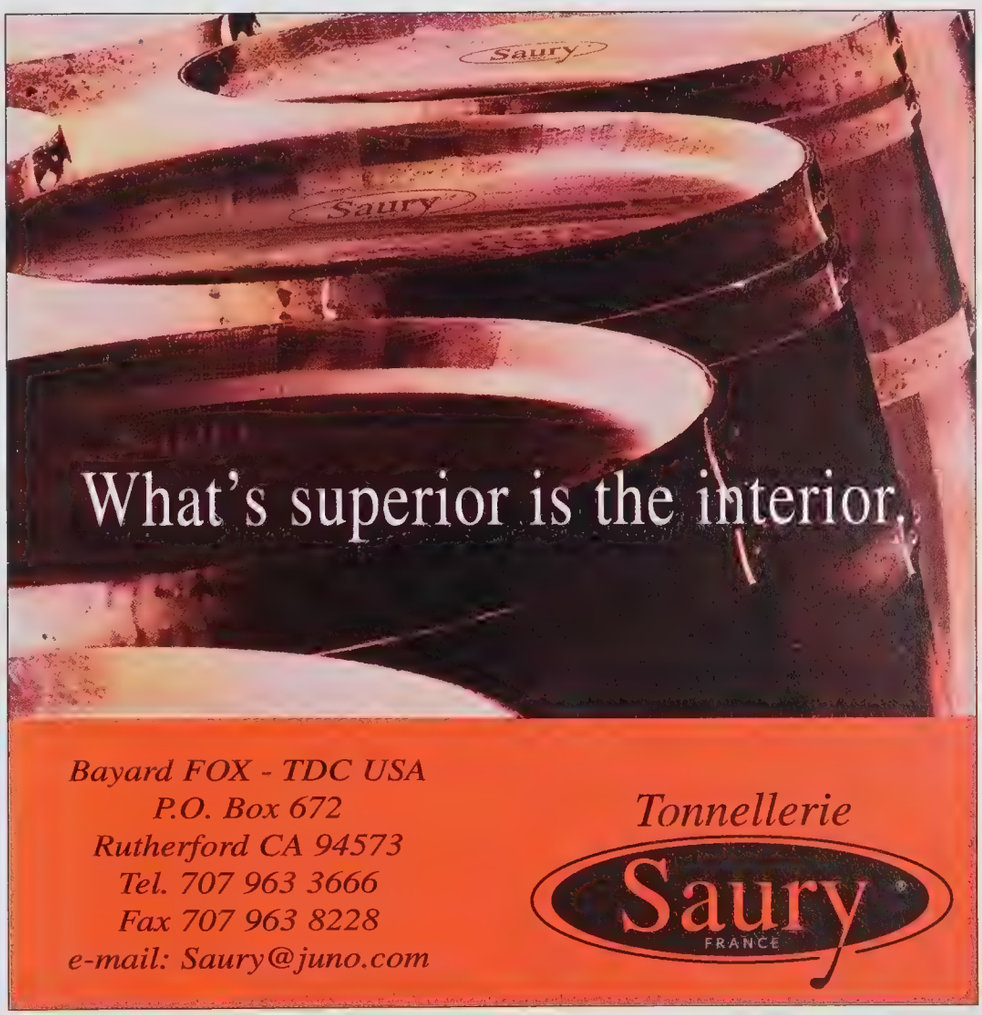
Establishing uniqueness

Although content to call it the Niebaum-Coppola clone of Cabernet Sauvignon, Golino reports that materials in the FPMS program are labeled "selections" because there's no absolute certainty about the genetic relationship between individual selections. For example, plant material from Pritchard Hill (historical Niebaum-Coppola vineyard planted in 1933 from cuttings of the original Niebaum planting) might be identical to Cabernet Sauvignon at To Kalon Vineyard that the Robert Mondavi Winery considers heritage.

"At this point in California viticultural history," Golino continues, "it is difficult to objectively determine whether clonal material is unique or not. Because a vineyard planted in 1975 is still producing superior fruit, does not mean it's planted with a unique clone or that it can legitimately be given a clone name associated with a site."

DNA technology can readily tell varieties apart. Clones, however, are genetically so close that the difference between two clones may simply be the expression of a single gene that is in both of them. It may be a mutation at one level in the cells, but not at other cellular levels. The difference between Pinot Noir and Pinot Grigio, for example, is a pigment mutation that does not show up in DNA tests currently available.

UC Davis grape DNA expert Carole Meredith, Ph.D., in conjunction with Jean-Michel Boursiquot of L'École Nationale Superiore Agronomique de Montpellier, has done research to dis-



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cover DNA probes that may tell clones apart. Using special techniques for analyzing DNA, Meredith is beginning to notice some pattern differences in Pinot Noir, an old and diverse variety. So far, she has not found anything that will distinguish Cabernets.

Significant Cabernet Sauvignon field diversity can stem from virus infection. For example, variation in berry sizes and different leaf formations may be fanleaf-virus related. Leafroll viruses can cause reductions in pigmentation or sugar levels in fruit. Such irregularities are not indicative of true clones but may cause obvious differences in vine performance.

The argument exists that the character of Niebaum-Coppola Cabernet Sauvignon, before disease was eliminated, stemmed from some of the diseases.

"Drip irrigation," McLeod maintains, "changes the flavors of wine more than viruses. When we couple proper irrigation management with the correct rootstock and trellis system, we have all the tools to accomplish the goal of making one of the best, site-specific Cabernets in the world." McLeod believes that having a unique clone of Cabernet is paramount to that objective.

"The best way, we believe, is to have the potential of a 120-year-old clone. That was our whole premise in going through the FPMS process. There will also be arguments that there are better clones. Our response is there are many good clones of Cabernet, but to us, no other clone has our history."

Clones and history

Because clones are so difficult to differentiate, their historical background is significant. Making it even more difficult is that genetic material can and does change over time.

Golino and McLeod both maintain that Niebaum-Coppola has history on its side to indicate that what exists now for the new disease-eliminated plantings is a true clone.

Viticulturists such as Rex Geitner (Spring Mountain Vineyard) agree that site is critical with Cabernet Sauvignon. "Some growers believe that they have a unique clone," he contends. "When all they have, for example, is Cabernet Sauvignon Selection 8 from the UCD program. After 40 years, it's still doing well on an unusually fine site. They, therefore, judge that they have a clone. All that's unique about their Cabernet Sauvignon is the site, not the genetic material.

"With some varieties such as Pinot Noir, clone is absolutely critical. With others it might not be as important as site and rootstock."

In the late 1940s and early 1950s, most of California's grapevines were severely virus-infected. Then, specific varieties were not nearly as important as they are today. Increments that needed to be made by industry and UCD were simply to provide clean, productive, and fruitful planting stock. In those days, high yield, good quality, and freedom from disease were top priorities. With planting stock in such disarray then, addressing those elements was a big step forward.

Also, many on the UCD faculty believed that once a grower had a clean vine, the clonal variation was not important. Dr. Harold Olmo disagreed and began clonal trials in the 1950s and 1960s. However, much of his research on the subject was never published.

In the 1940s and 1950s, clonal research programs began in Germany. The California wine industry lagged behind. By the 1970s wine boom in California, there was a shortage of resources for import and quarantine. Since there had never been any dedicated programs to perform that work, it was hard to obtain European plant material. Some Dijon clones came into Oregon, but they were a tiny fragment of what was available in European programs.

Even in the 1970s, most California growers weren't thinking about clones. Progressive viticulturists started to consider clones only in the mid-1980s. Until then, diversity was limited to five or six Cabernet Sauvignon selections in the UCD clean stock program.

"A number of those," Golino indicates, "were only different heat treatments of the same genetic material. They didn't qualify as clones because there is every reason to believe they are genetically identical.

"The Europeans invested millions of dollars in clonal research programs, but California never did. It was not

until the wine industry got involved and petitioned Congress that the National Grapevine Importation & Clean Stock Facility at UCD became a reality in 1994. With the new facility, it has been possible to bring in diverse clones of major wine varieties from around the world and investigate their potential in California."

Preservation challenges

Since so much Clone 7 or 8 Cabernet Sauvignon was planted on AXR-1 by the late 1980s, much historical lineage for heritage vines was lost. Golino needs to know a given vine's history before she has any interest in preserving it. She relied on the leading wineries and viticulturists to provide specific cuttings of historical significance. At investment costs of $10,000 to $12,000, she is unwilling to take just any plant material.

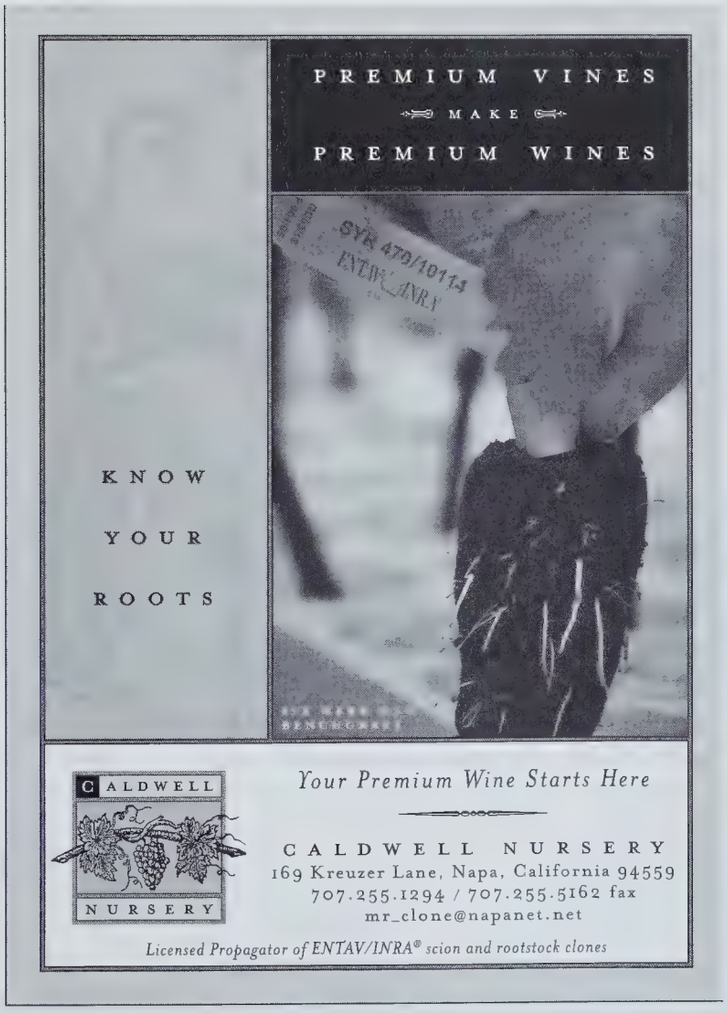
In the Napa Valley, viticulturist Phil Freese (then at Robert Mondavi Winery; now of Zelphi Wines, Healdsburg, CA) connected Golino with wineries that had heritage Cabernet Sauvignon vineyards. In addition to the Neibaum-Coppola selection, Robert Mondavi Winery's then 50-year-old To Kalon Cabernet Sauvignon vines were chosen, as well as the "See Clone" favored at Silverado Vineyards by winemaker Jack Stuart.

Although virus-infected, all these vineyards produced excellent wines over a long period of time. In addition, they had all been propagated on AXR-1. The virus effects were mild because AXR-1 is a very forgiving rootstock when it comes to virus. But the vineyard selections need to be preserved, because they were beginning to decline due to phylloxera.

With the loss of AXR-1 rootstock in the same time frame, it became apparent that viruses had a detrimental effect on some of the newer phylloxera-resistant rootstocks, which were quite susceptible to virus. Among other factors, one of the reasons for AXR-1 popularity was that clones infected with virus performed well in spite of pathogens.

Geitner believes that in the AXR-1 years, new plantings moved diseased plant material from one vineyard to another. "Wineries in the Napa Valley, in particular," he notes, "were making some very good wines; even great ones, from some severely virused vines. We soon learned that such disease killed other rootstocks."

Based on history at Niebaum-Coppola (formerly Inglenook), Rodriguez knew that the Pritchard Hill vineyard planted in 1933 had original clonal material from Gustav Niebaum's plantings. In September 1989 (because damaging pathogens were easily recognized at the end of the growing season), Golino and Rodriguez selected Cabernet Sauvignon cuttings to begin the testing and disease elimination program at UCD.



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Testing established that the original material was infected with leafroll, fleck, Rupestris stem pitting, and corky bark. Micro shoot tip therapy was used in 1990 and 1991 to propagate the new Niebaum-Coppola selection (FPMS 29) free of these viruses.

After years of extensive testing with both biological indexing techniques and laboratory analysis, early release of 150 vines on 1103-Paulsen rootstock was made to Niebaum-Coppola in 1996. After harvest 2000, cuttings were collected and the original vines budded 10,000 additional vines in spring 2001. Public release of the Niebaum-Coppola selection through the FPMS foundation was announced in autumn 1998.

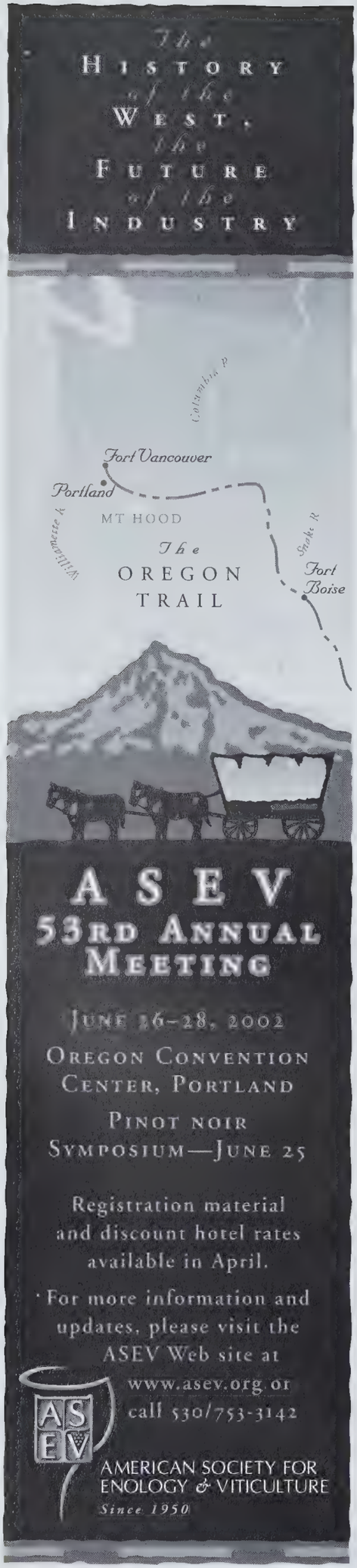
Even though the Niebaum-Coppola selection of Cabernet Sauvignon is available to the public, its expression may be different on other sites. Also, an improved field selection, now planted at Niebaum-Coppola, may be different from the Niebaum-Coppola clone created through micro shoot tip culture.

Golino notes the fact that many of the older French clones were virus-infected. Over the years, the French have made progress in improving the sanitary status of vines. For example, Cabernet 337 has a mild strain of leafroll virus. When the French remove the virus, they will release it as a new clone. They believe if a virus is removed, it changes the performance of a vine; hence it's a new clone.

When you don't have time

If a grower has a grand old block of Cabernet Sauvignon or Zinfandel, what steps are necessary either to propagate it, clean it up, or determine whether it is a unique clone?

Even Niebaum-Coppola could not wait 10 years to replant disease-eliminated vines. Over the period 1989 to 1998, two processes were ongoing.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Sue Sim (staff research associate) uses a dissecting microscope as she cuts 0.5 mm shoot tips from a grapevine candidate infected with a virus disease. Sim did the tissue culture work to clean up the Niebaum-Coppola Cabernet Sauvignon in the early 1990s.

McLeod knew that fanleaf was an especially serious problem in vineyards in the Rutherford area. In replanting, a field crew might be pulling 200 buds from one vine. A single infected vine would extrapolate to a much larger problem when propagated. Determining which viruses were present was critical before any replanting could begin.

With 20 individually-tagged dormant cuttings from the same vines chosen by Golino and Rodriguez, McLeod used the services of Agri-Analysis to determine which vines were "virus-undetected," a better term than virus-free in the opinion of Glenn Friebertshauser (Agri-Analysis). Golino uses "specific pathogen-tested," because she believes virus-free is an intellectual concept. "It's not a sterile world and there are all kinds of organisms in plants that we are just beginning to understand," she contends.

Friebertshauser notes that of all vines submitted for routine indexing, only between 8% and 12% show up as non-detect across the whole panel of viruses. He believes that some of the undetected viruses are present but are still beneath the radar screen. There are different degrees of significance of having virus in a vine, although the majority have Rupestris stem pitting-associated virus.

In the early 1990s, McLeod began to propagate the virus-undetected vines for eventual replanting of blocks on the Niebaum-Coppola property. To mitigate potential problems of a latent virus, he planted mostly 1103-Paulsen, a rootstock with St. George parentage. He believes it carries many of the best attributes of that rootstock, which has a long history of success in California's oldest vineyards and has a high tolerance for latent viruses.

Following suit

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tion, the next step is FPMS diagnostic protocol. Golino advises a vintner that if the plant material is "clean," tests requiring about two years, are needed. If the material is infected with virus, meristem propagation is required to eliminate the virus, and the entire process takes approximately five years if every element is in place.

Agri-Analysis tests, which target the serious, damaging diseases, are insufficient at this point. "I'm not minimizing the importance of the fast lab tests like ELISA and PCR," Golino adds. "Using them is a good, much cheaper, and faster way of getting a fix on what's going on with specific vines than running the complete set of tests including field indexing."

Fundamentally, Friebertshauser is a protegee of Golino and Dr. Adib Rowhani at FPMS and the developmental work in grape virology they've done at UCD. In 1994, when the Neibaum-Coppola field selections were screened at Agri-Analysis, ELISA was state of the art. It's still used in some diagnostic routines, especially for cost-effective large scale surveys for grapevine fanleaf virus.

At Agri-Analysis, both Enzyme-linked Immunosorbent Assay (ELISA) and Polymerase Chain Reaction (PCR) tests can be used to detect, among others, leafroll-associated virus types 1, 2, 3, 4, 5, and 7; viruses A, B, and D; fanleaf virus; fleck and yellow vein viruses; rootstock stem lesion associated virus, and Pierce's disease. There are 14 different tests that can be run by PCR, which include strains of some of the newer viruses.

Current state-of-the-art PCR refers to the process of selective amplification of a small part of the genetic code of a particular organism. It's effective in the detection of grape viral pathogens because each virus has its own genetic code, which can be cloned and sequenced by experts in molecular biology. Rowhani is one of the leading scientists in a global team working to develop PCR probes for all grapevine viruses.

Over the last five years, PCR technology has expanded testing capacity

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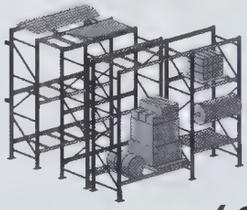
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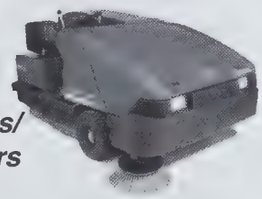
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for many more viruses that could not be detected using ELISA. More expensive than ELISA, PCR testing can be completed in one day. It has revealed new information, especially with regard to grapevine virus B, believed to be one of the viruses that causes corky bark disease. No reliable ELISA test has been developed yet for this virus but the PCR works well.

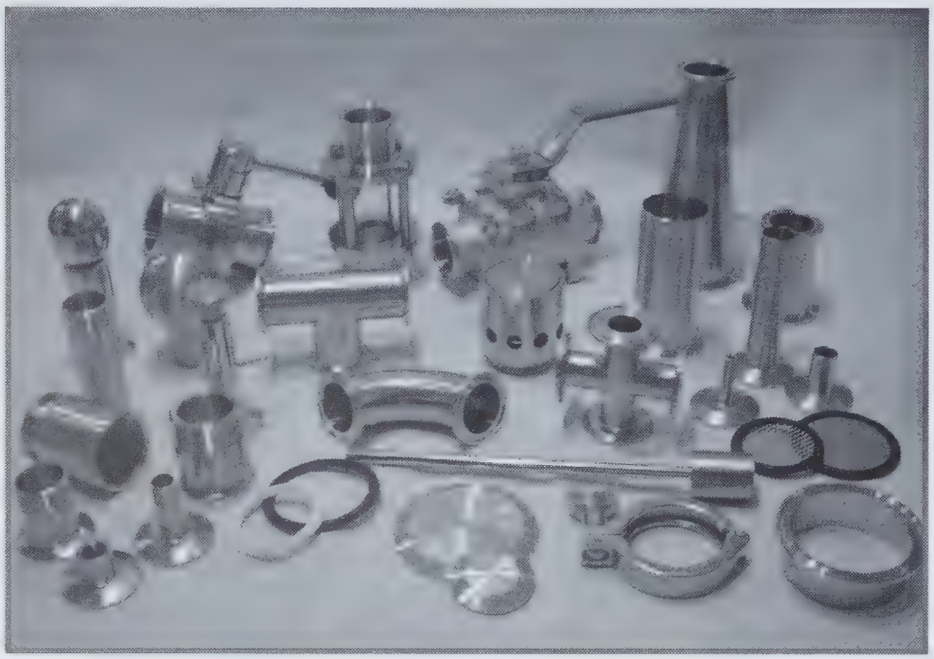
Viral hide and seek

All grape viruses are capable of playing hide and seek in a vine. That's another aspect of testing for indexing. Rootstocks play a role that is still being sorted out. If one grape virus is present, it may display a singular effect on the rootstock. If a second virus is also present, the impact can be greater than either alone. Viral impact may change depending on what rootstock the infected plant material is grafted to.

As an example, there's a range of reactions and one of the more challenging is the new viruses associated with Redglobe, a table grape variety. Its impact shows up immediately on the rootstocks 3309 and Kober 5BB. But Freedom rootstock seems immune.

Golino has a collection of about 50 different virus isolates in different combinations, and she's conducting mass inoculations with randomized trials. She notes that Freedom does seem to be susceptible to a combination of type 2 leafroll and grapevine virus B (GVB), apparently one of the major agents of corky bark.

"Corky bark as described in textbooks," she explains, "is probably a



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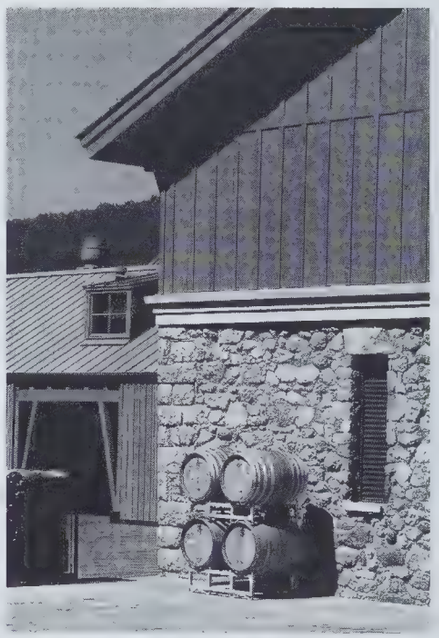

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combination of leafroll type 2 and GVB together. We're creating deliberate mixed infections to prove this. GVB does not display the effect by itself.

"Using modern virus testing technology, a vineyard can be checked to search for escapes, vines that are not infected, although many vines in that field are diseased. These occur especially when there's mixed infections with many viruses that tend to compete with each other, making for very uneven virus distribution."

The preferred technology to eliminate virus from diseased vines at FPMS is micro shoot tip culture. It involves regenerating a grape vine from a shoot tip that is less than 0.5 mm long in sterile tissue culture. This technique (often referred to as "meristem" therapy) is effective for eliminating most viral, bacterial, and fungal contaminants.

Once plants in sterile culture grow well-developed roots and shoots (at anywhere from two to six months), they are transferred to soil and slowly adjusted to ambient humidity in a plant growth chamber over a three-week period. Plants are later moved to a greenhouse and then a screenhouse environment. There, they must grow for one or two more years to produce sufficient hardwood cuttings to conduct all the tests that determine if the disease was successfully eliminated.

McLeod questions the advantage of using the shoot tip as opposed to midcane. Golino explains, "It's best to go into a shoot primordia where there's a meristematic dome, containing pure genetic material. Frequently in horticultural crops, that tissue does not have virus. We presume that's because the vascular tissue has not yet differentiated."

Inherent risks

Geitner believes that when a winery uses the FPMS program, there's a higher degree of confidence that plant material is cleaner than material which has not undergone the process. This is different than selling plant material from a vineyard, even though it has passed ELISA and PCR.

Although this is often done indirectly through nurseries and increase blocks, there is a high degree of risk.

What if a grower wants to create plant material not just for his own use, but to the point of starting a vine nursery business? Golino replies: "First, I will tell him that the nursery business is hell and he should think about it again. But if he wants to go forward, he wants to do more than the Agri-Analysis tests.

"For the nursery business, have the full FPMS testing conducted. Have the cleanest material possible using meri-

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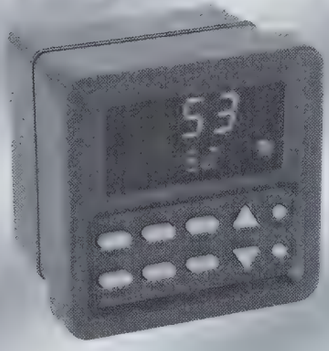

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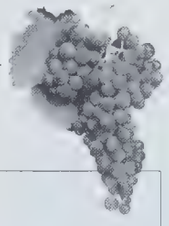

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stem technology even though that takes generational time. Have it planted at FPMS, so it can be in the California Grapevine Registration and Certification program and then distribute it from there.

"When a grower wants to plant additional acreage of a given clonal selection made through a field selection for his own wine growing program, Agri-Analysis screening may be sufficient.

"If a vintner wants to 'make' a clone and distribute it, the way Robert Young has done with his well-respected Chardonnay, that's a different case. The Robert Young clone is maintained at FPMS in the Foundation vineyard. In these cases, for the grower's own protection, he will want to have a lot of confidence the wood is clean because one might get sued if it was not clean."

Site specificity has inherent risks in growing even registered material outside of greenhouses. This is another variable that's thrown into the equation of what's perceived to be clean plant material.

Geitner explains that a site may bring disease to a registered vine or rootstock. "We know," he says, "that corky bark was found in certified, registered St. George in the 1970s. There's a good chance that it brought the virus to the vine budded to it and it spread from there. A virus non-detect vine might contract a disease through a rootstock. We don't have answers to all the questions that are out there."

Ongoing experiments

Golino's initial interest in heritage vines was to study the issue of virus infection and wine quality. She desired to assess famous, disease-eliminated historical clones side by side with diseased materials.

Meristem micro shoot tip therapy at UCD was used to create three heritage Cabernet Sauvignon selections 29, 30, and 31, gifted by Niebaum-Coppola, Silverado, and Robert Mondavi to the FPMS public collection. The original virus-infected selections were preserved, so it is now possible to do side-by-side comparisons.

With the help of the American Vineyard Foundation and the Viticulture Consortium, a research trial is being established at UC's Oakville Field Station. Golino and her colleague James Wolpert, Ph.D., in the UCD Department of Viticulture & Enology, have begun the nursery and establishment phases of this clonal trial.

It will be used to evaluate the certified Niebaum-Coppola clonal selection, other new heritage selections, their original virus-infected source vines, and trademarked clones from the ENTAV French/American joint venture. It is their hope that with this project, any lingering questions about the effect of virus on grape fruit quality, and ultimately wine quality, can be answered. ■

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Managing mites: the good, the bad, the enigmatic

BY Laura Breyer, IPM field specialist
Nick Frey, Executive Director, Sonoma County Grape Growers Association

For the past two years, four Sonoma County grapegrowers have had an extra tool to help manage mites in their vineyards, courtesy of the Sonoma County Grape Growers Association's (SCGGA) Integrated Pest Management (IPM) project.

Funded in part by the California Department of Pesticide Regulation, the program has provided growers a venue to exchange ideas and experiences in managing mite infestations in their vineyards while reducing use of miticides under Proposition 65 review.

Key goals of the project are to reduce uses of the miticides fenbutatin-oxide (Vendex®) and propargite (Omite®) and to encourage growers to adopt improved IPM techniques. Though fast-acting and effective, Vendex and Omite are targeted by the California's Proposition 65 as possible developmental toxins, and Omite is also listed as a potential carcinogen. Both products may be unavailable in the future, though a scientific panel has since concluded that evidence was inadequate to maintain Vendex on the Proposition 65 list as a developmental toxin.

It behooves growers to learn how to begin managing mites with softer materials (those with little environmental impact) and cultural methods (such as planting permanent cover crops to reduce dust or irrigation to minimize vine stress) while their standard materials are still available to back them up during the learning process.

Softer materials include cinnamaldehyde (Valero®), pesticidal soap (M-Pede®), light spray oil (such as JMS Stylet-Oil®), avermectin (Agri-Mek®), and pyridaben (Nexter®, Pyramite®).

Weekly monitoring observations from the four demonstration vineyard blocks are recorded in a commercially available IPM database. Summaries of plant-feeding and predatory mite populations are generated and provide a focal point for monthly grower meetings. A graph from each block shows infested leaf counts for plant-feeding Willamette and Pacific mites and the beneficial predatory mites.

With two years' worth of monitoring information, a graph allows an almost immediate comprehension of the current status of mite infestation, and a comparison with the past.

The graph emphasizes to growers who attend the monthly meetings the importance of three critical steps in a good IPM program: monitoring, recording the information, and using the information in pest management decisions. Managers of the four monitored blocks are all committed to strong IPM practices; group discussions usually ensue regarding when and if treatment will be necessary and other management strategies that may be employed.

Sonoma County has mixed populations of Willamette and Pacific mites. Some vineyards have one or the other species; some have both. Pacific mites are notorious for mid- to late-season population explosions that rapidly debilitate vine canopy. Acute problems with Pacific mites (meaning unpredicted appearance and rapid population expansion within a growing season) are more common in warmer vineyard areas such as the Alexander Valley or Dry Creek Valley. Stressed, dusty vines make mite problems worse.

Willamette mites are generally a chronic problem (meaning low to moderate populations throughout the growing season) in cooler viticultural areas, such as Carneros or the Russian River Valley in Sonoma County. They also capitalize on stressed vines.

The best way to monitor mites is to track their incidence (the percentage of leaves infested with mites) and severity (the number of mites per leaf). For example, if five leaves out of ten have one or more mites, the incidence (or "infestation") is 50%. If those five leaves have only a few mites each, say less than three mites per leaf, then the severity is on the low side. If those five leaves have 30 mites per leaf, the severity is on the moderate to high side. The IPM Field Log database currently does not account for severity monitoring.

Predators such as six-spotted thrips and predatory mites (*Galendromus spp.*) help keep Willamette and Pacific populations under control. When vine and weather conditions favor plant-feeding mites, their populations can increase rapidly, necessitating a pesticide treatment. If there are enough predators, the plant-feeding mite population will be contained.

Research from the University of California has shown specific ratios at which suppression of mite populations can be expected due to predatory mites. For every two leaves with one or more plant-feeding mites, if there is one leaf with one or more predatory mites, it can be expected that the plant-feeding mite population will decrease. This is a ratio of 1:2 (50%). Ratios under 50% may or may not be effective, and if less than 10%, the predatory mites will not be effective. (See the UC *Grape Pest Management* manual for details.)

Laura Breyer is a pest control advisor and owner of Breyer's Vineyard IPM Service. She has worked with SCGGA since 2000. Together, they won a California Department of Pesticide Residue 2000 IPM Innovator Award.

Nick Frey, executive director of Sonoma County Grape Growers Association, heads the SCGGA IPM Project Management Team that developed and implements the IPM program for Sonoma County grapegrowers.

The monitoring observations in the following graphs were collected from one block of a vineyard in each of four Sonoma County viticultural areas: Alexander Valley, Dry Creek Valley, Russian River Valley, and Sonoma Valley. Weekly incidence monitoring of 40 leaves per block included observations on the percentage of leaves with mites as described above. The SCGGA IPM management team is currently trying to incorporate severity monitoring into the database, since it was used in decision-making but not formally recorded.

In this report, readers will notice the graphs have "Damage" along the Z-axis. Damage was rated on a subjective 5-point scale, ranging from "none" to "treatment needed," based upon appearance of leaves in the canopy. If mite canopy damage reached the "moderate" level, the population was usually too high at that point to be managed with a soft material because soft materials are typically not as fast-acting or effective as standard miticides.

Ultimately, management and treatment decisions were based on incidence and severity monitoring, mite history of the block, current stress level of the vines, relative amount of canopy to crop, and proximity to harvest.

Although included in our customized IPM database, the damage rating did not prove to be very useful for making management or treatment recommendations. But it may be useful in helping to document management and treatment decisions of mite populations because it describes the condition of the canopy, which is, after all, the essential concern.

Reedy Ranch, Alexander Valley

Keith Horn of Clos du Bois manages the winery's warm bottomland Chardonnay vineyard on the Reedy Ranch outside Healdsburg. It had been treated for mites in previous years due to various factors, including low vigor caused by encroaching phylloxera.

Intensive management efforts over the years to reduce vine stress may have helped reduce initial plant feeding mite populations in 2000, as no plant-feeding mites were detected early in the season (Figure I). By mid-July, however, Willamette mite populations began building, with 50% of the leaves infested when monitoring ended in late August. A few Pacific mites were also noted in August.

Predatory mites were virtually absent here in 2000. Predatory mites usually provide reliable biological control of plant-feeding mites; a dearth of predatory mites will often open the way for high populations of Willamette or Pacific mites. This vineyard has all the key ingredients for a healthy population of predators: lush cover crop, relatively lush canopies in areas without phylloxera, and no hard pesticide use.

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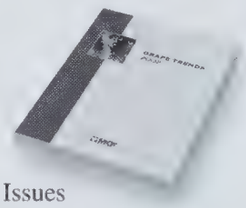

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Why were the predatory mites lacking? Perhaps they were consumed by the other predators such as whirlygig *(Aanystis spp.)* mites (big, red, frantic mites), 6-spotted thrips, minute pirate bugs or mite-eating beetles which were occasionally observed during sampling. These larger, more mobile predators are known consumers of plant-feeding mites, but their overall effects on Pacific, Willamette, and predatory mite population dynamics are unknown. If we had a better understanding of the nuances of predators, we might be able to manipulate biological control more successfully.

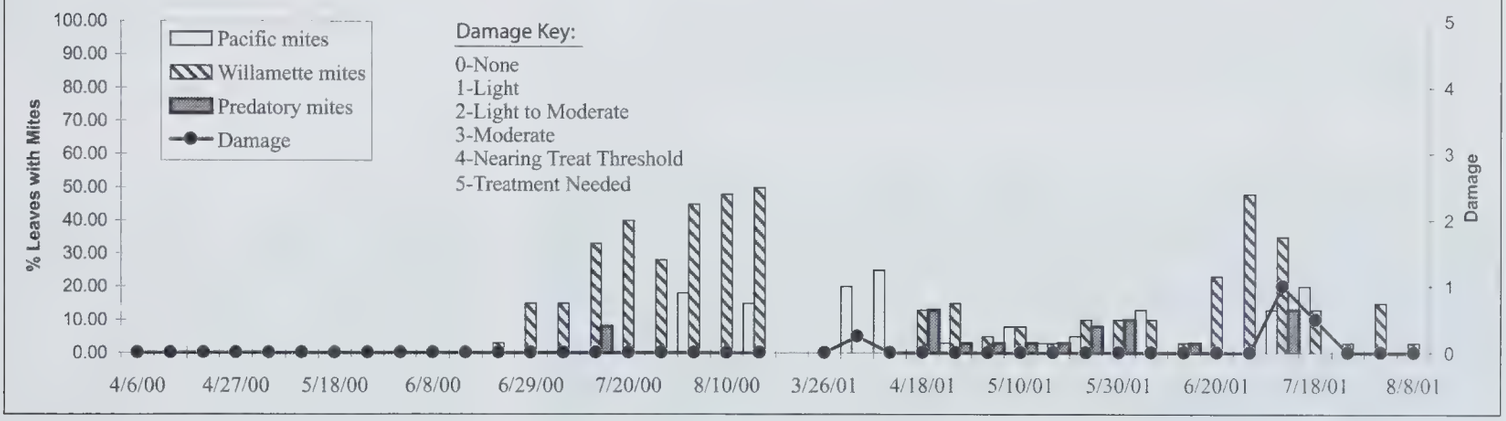
Despite a total 65% infestation (an average of 6.5 leaves out of 10 had one or more Willamette or Pacific mites) in early August 2000, no treatment was applied, since the actual number of mites per leaf was low and canopy damage was negligible.

Extensive efforts to maintain a growing canopy with fertigation and good vine water status, and the presence of natural enemies other than predatory mites as discussed above, were likely factors in the low severity of plant feeding mites and good canopy condition. Other factors that contributed to the decision not to treat included the vines' light crop and early anticipated harvest.

The 2001 crop year provided a completely different picture, with low levels of Pacific and Willamette mites from the beginning of the season. As the IPM Project's pest control advisor (PCA), this author found that Pacific mites early in the season sometimes can foretell more serious mite problems later in the year. The presence of predatory mites may have been responsible for preventing the plant-feeding mites from getting out of hand, at least until mid-June 2001.

The right quarter of Figure 1 shows a rapid increase of Willamette mites, from less than 3% infestation to nearly 50% within two weeks. This coincided with the disappearance of the predatory mites. It seemed unusual that

Figure I: Reedy Ranch, Alexander Valley, 2000 – 2001



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Willamette mites (rather than the Pacific mites) increased so rapidly, but that is just another example of the enigmatic nature of mites.

It seems likely that environmental conditions became favorable to Willamette mites and unfavorable to predatory mites. Pacific mites have a different distribution in the canopy than Willamettes, and this may have influenced the difference in population growth between the two species in this particular situation. In the absence of biological control and with the presence of favorable weather, the Willamettes multiplied.

Horn decided to treat based on several factors: the early season mite infestation followed by 50% infestation in July 2001, no predatory mites and a projected growth curve perhaps reaching 100% infestation before August. The mites were moving into the mid-canopy of the phylloxera-stressed and devigorated block.

Devigoration was much more apparent in 2001 than 2000, despite continued efforts to maintain vine vigor and water status. Horn was committed to not using miticides targeted by Prop. 65 or the Food Quality Protection Act (FQPA). That eliminated Omite, Kelthane® (dicofol), and Vendex from consideration. An application of Avermectin (Agri-Mek®) in the second week of July 2001 took the population to near zero within three weeks.

Comparing the graph to the written notes in the IPM database for this Alexander Valley block gives some insight to differences that led to treatment in 2001, but not in 2000. Since vineyard management can be as much art as science, not everything that is pertinent to management can be captured in graphs.

Years of experience help vineyard managers synthesize factors such as vine balance, weather, and mite behavior in determining whether to treat when monitoring shows mite populations increasing.

Unfortunately there is not room here to reproduce all the comments entered into the IPM Field Log. But as a summary, the presence of mites in 2000 was actually unremarkable in this block until August, at which time harvest was close enough to make treatment unnecessary. By May of 2001 both Pacific and Willamette mites had been noted as needing to be closely monitored, and by July the decision was made that the balance had tipped towards needing chemical management.

Adams Ranch, Dry Creek Valley

A hill-and-swale Merlot block managed by Clendenen Vineyard Management, Adams Ranch west of Healdsburg, has needed miticide applications in some years, including the 2000 season. Initial monitoring by the IPM Project's PCA in the first week of April 2000 missed a sizable population of Willamette mites on the six-inch long canopy, but were observed by John Clendenen's viticulturist.

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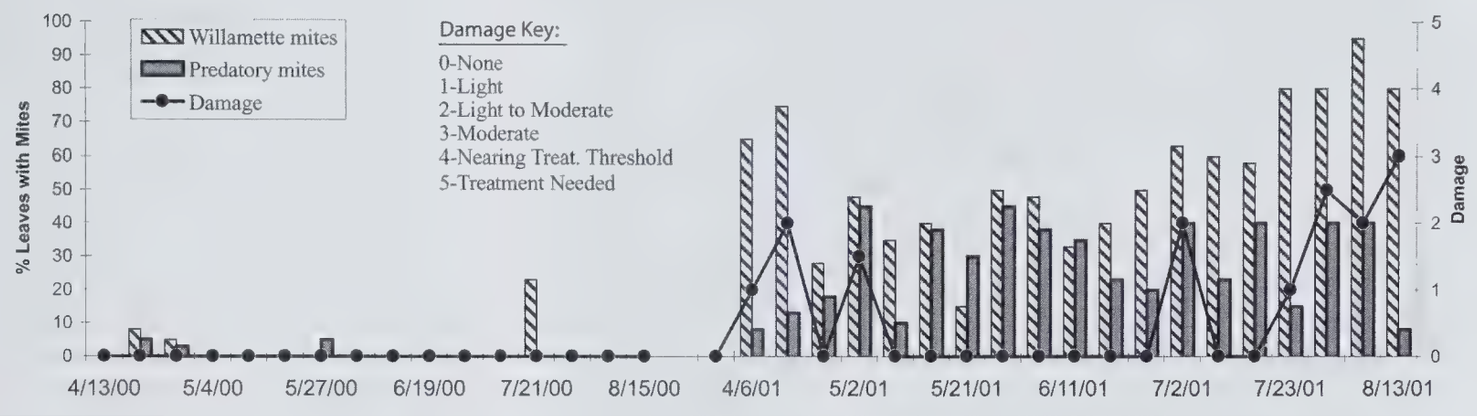
A few indigenous predatory mites and an oil application resulted in leaves with the Willamette mite populations decreasing to a 45% incidence within one week, and tapering off to less than 10% by mid-May. In June, Pacific mite populations were increasing with few predatory mites to keep them in check.

Spot treatments with the quick and effective miticide Vendex were made because this low-vigor, hot-hillside vineyard's history of damaging late season Pacific mites had rendered softer methods inappropriate. Populations were dropping under 25% infestation when monitoring ended two weeks later.

The graph shows the average of the four quadrants that were individually monitored for this block. In the raw data, the northeast and southwest quadrants had higher mite populations. These were the areas that were spot-treated. The sprayer was turned off when it was away from the areas

Figure II: Martini Ranch, Russian River Valley, 2000 – 2001



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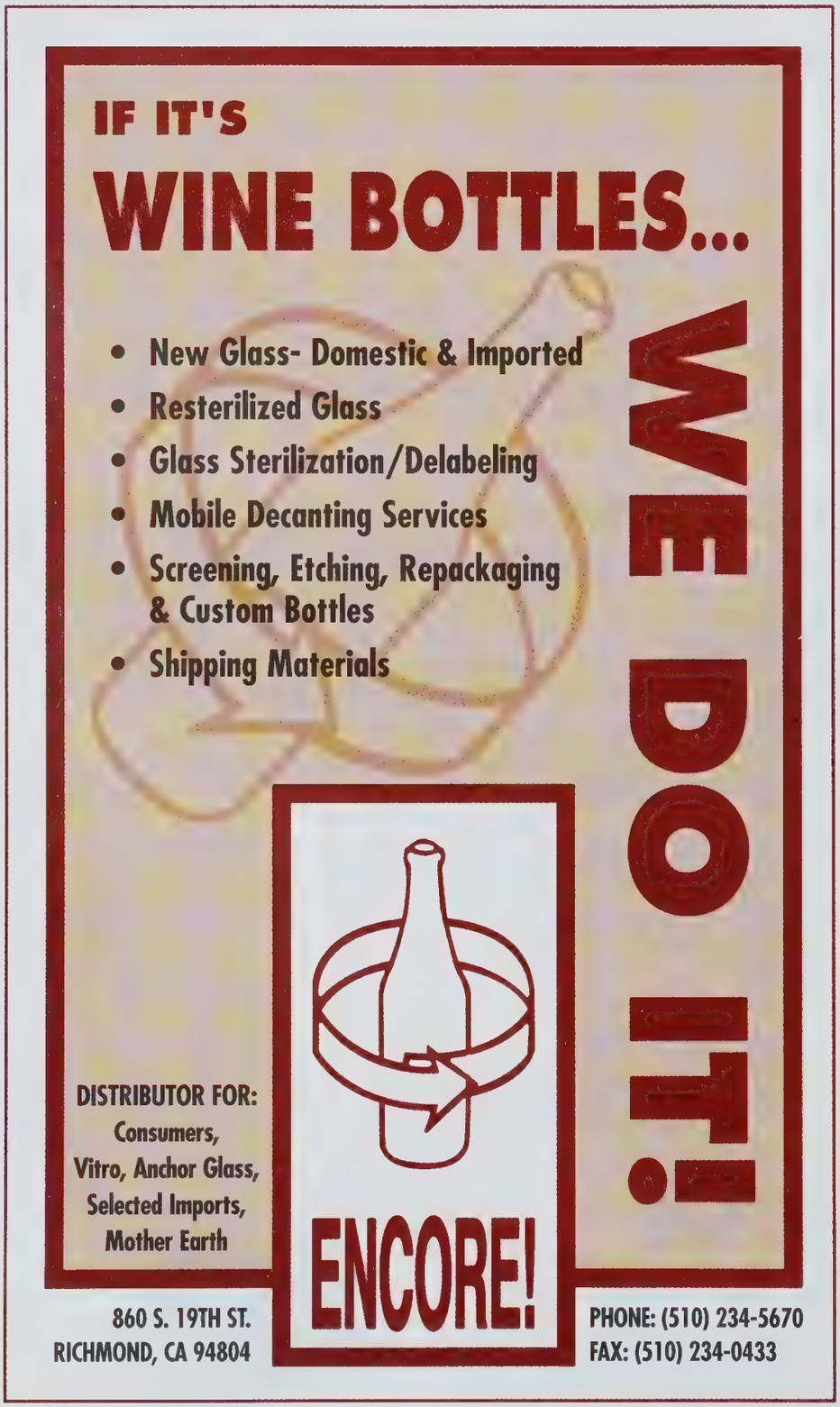
with high mite populations. The benefits of this approach are three-fold: it is quicker and less costly than treating the whole block, it conserves natural enemies, and it requires less pesticide.

Due to the mite problems in 2000 and a strong desire not to use Vendex again, Clendenen began the 2001 season with JMS Stylet-Oil applications in place of the usual first copper/sulfur mildewcide or fungicide applications for powdery mildew (the oil is also a registered mildewcide).

Mites were virtually non-existent until July when a small mixed population of Willamettes and Pacifics appeared. No treatment was needed. An adjacent Zinfandel vineyard managed in the same fashion did require late season spot treatment. Other growers have also reported mixed results with early season oil applications for mite control.



Martini Ranch, Russian River Valley

Figure II shows Martini Ranch, a five-year-old Pinot Noir vineyard managed by Bevill Vineyard Management that had no mite problems in 2000. This was attributed to several factors, including a lush, no-till cover crop consisting of annual grasses and clovers. Duff Bevill (vineyard manager) suggests that the beneficial insects had a chance to build up due to no hard chemical use and cooler temperatures. Meanwhile, maintaining low vine stress discouraged plant-feeding mite population growth.

The 2001 season started with over 60% of leaves infested with Willamette mites. The infestation level fluctuated between 15% and 95%, averaging 55% over the season. Predatory mites were also present in ratios with the Willamettes ranging from 2:1 (200% — excellent expectation for control) to 1:10 (10% — very poor expectation for control).

Over the course of the season, the average ratio was 1:3. Excluding the first and last sample dates, the average ratio was 1:2 (a very good expectation for control), yet the Willamette mites maintained 55% infestation. There were no management changes from one year to the next. Obviously we are ignorant of some very important factors that affect mite population dynamics, since they can behave very differently from year to year in blocks that appear essentially the same.

Despite a very high percentage of canopy infested with Willamette mites from late July through early August, and light to moderate damage accumulating in the canopy, treatment was not necessary. Neither the harvest date nor yields were likely to be impacted substantially by the infestation, and there was a desire not to disrupt the predators. Given a later ripening variety, a delayed season, or less canopy for the crop load, the decision would likely have been to treat.

Rancho Salina, Sonoma Valley

Joe Votek of Loma del Sol Vineyard Management in Sonoma Valley manages Rancho Salina, a moderate- to low-vigor hillside Merlot vineyard with east/west rows. The 2000 year began with moderate Willamette mite populations that caused light damage to the young canopy. The damage rating was based on subjective assessments discussed in the introduction. In this case, light damage meant that less than one leaf per two vines had any evidence of mite feeding. Votek considered treatment with a soft material, but waited. He was rewarded with favorable results.

The damage rating decreased to zero as the canopy outgrew early damage. One or two Pacific mites were found in mid to late July. Willamette mites seem to have disappeared from late July to early August, only to have suddenly reappeared at an 80% incidence infestation from August 7, 2000. Causes of the increased infestation are unknown.

Speculation is that the Willamette mites didn't disappear, but the monitoring method missed them since grape leafhoppers were being monitored simultaneously. The 40 leaves monitored were biased towards the basal leaves on the southern exposure, where leafhoppers were more prevalent. The Willamette mites in this vineyard were on less exposed leaves. In any case, the severity was low, mite damage was negligible, and treatment was not needed. The 2001 season had no mite problems.

Putting it all together

For growers who have a commitment to IPM strategies, mites are one of the most challenging pests, requiring growers to walk a fine line between the art and science of vine husbandry. Knowing when and if a treatment is necessary means relying on good monitoring data combined with intuition and experience.

Sulfur is the most commonly applied pesticide in vineyards and is used to control powdery mildew Many of the softer miticides are active not only against mites, but also mildew and leafhopper nymphs. Using softer chemicals like JMS Stylet-Oil for early season mites not only reduces initial mite populations, but may also help predatory mite populations become established, since there is some evidence that sulfur can be detrimental to them.

Sulfur dust particles may physically interfere with the predatory mite's ability to search for prey. Sulfur in dust or wettable form is active against mildew for a number of days, and it may have toxic effects on predatory mites, too. The soft materials are contact materials and seem to have less effect on beneficial populations (this may include beneficials that attack grape leafhoppers, too).

In 1999, a Napa Valley grower replaced all sulfur applications with oil

in one block. He was determined to get away from Omite, and he was rewarded with very clean vines at harvest while the adjacent blocks suffered the usual mite damage. It was expensive considering that the block was planted for White Zinfandel, but a satisfying experiment that also eliminated his problematic grape leafhoppers.

Growers, however, should be careful using this season-long strategy if they have high mildew pressure because there is insufficient experience with this product as a standalone mildew control material. Oil is classified as a mildew eradicant, meaning it doesn't prevent mildew spores from germinating but kills them after they've started growing. Sulfur is a preventative, meaning it only prevents spores from germinating.

When oil alone is applied, it prevents a visible mildew infestation by eradicating it as it germinates. Perhaps even more so than with sulfur, good coverage is essential for efficacy. If oil and sulfur are to be applied in the same season, then the applications should be 10 to 14 days apart to avoid burn. The time difference depends on what brand of oil and what type of sulfur are used; as always, read the labels thoroughly and follow the directions.

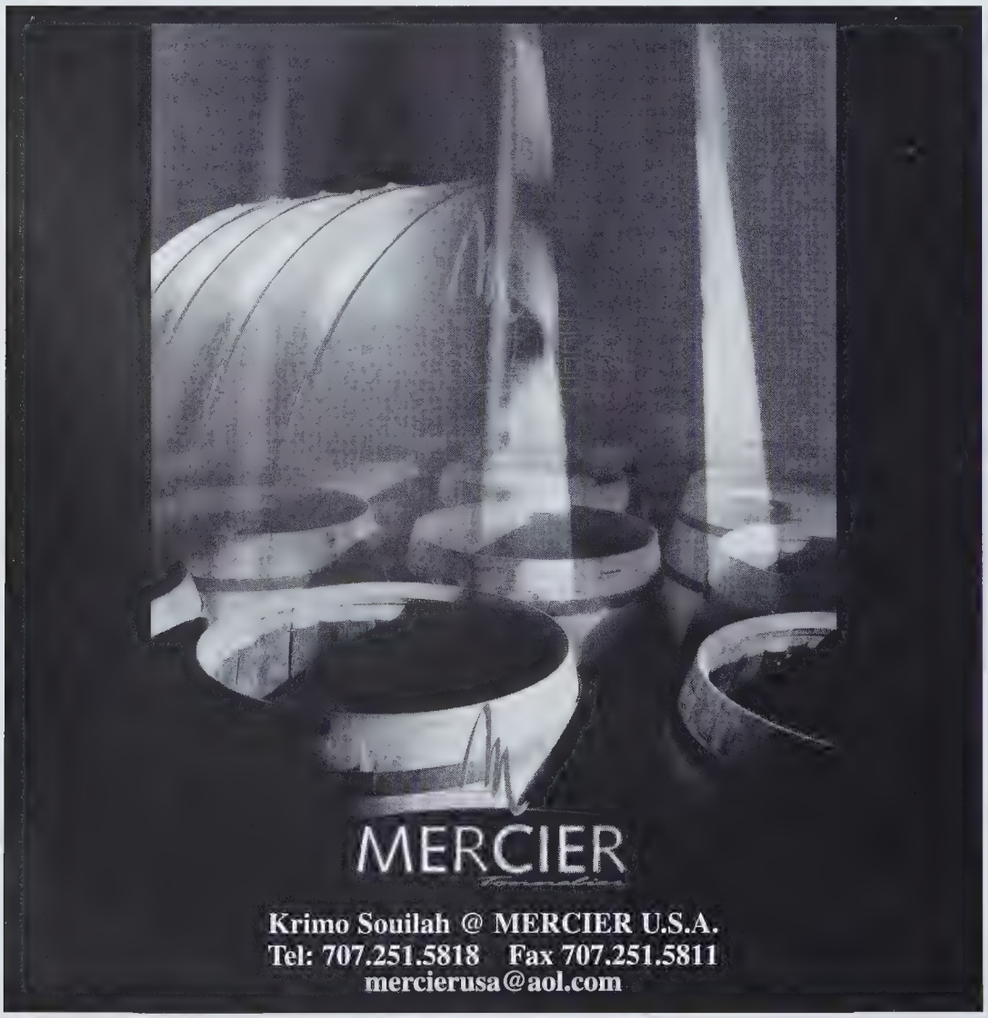
Aside from monitoring plant-feeding and predatory mite populations, watching damage, and making appropriate pesticide choices when necessary, there are other more passive strategies for helping deal with mite problems:

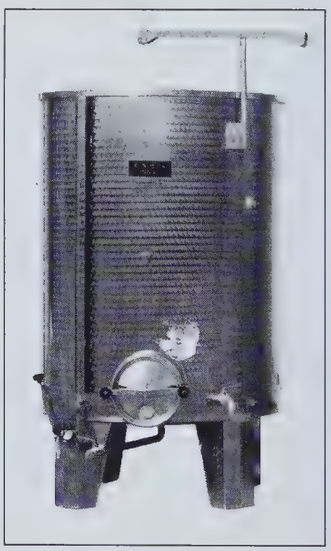
Reduce vine stress with adequate water, fertilizer, and an appropriate crop level. This not only makes a less favorable habitat for Willamettes and Pacifics, but it also seems to improve conditions for predatory mites while producing more canopy to tolerate a little more damage.

Maintain summer cover crops. Empirical observations suggest there is a greater abundance of mite-eating beneficials in vineyards with cover crops, but research has not yet confirmed that cover crops will significantly reduce mite problems. Indications are, however, that the lusher the cover crop, the fewer the mite problems. Be advised, though, that a cover crop that lowers vine vigor and induces water stress will likely result in increased mite pressures.

Reduce dust. Mite problems are created or made worse by road and disking dust, and possibly sulfur dust.

Conserve beneficials. The use of insecticides for control of other pests impacts predatory mites and other beneficials. That's one angle of the "integrated" part of IPM to keep in mind: that the decisions made for one aspect of the vineyard affect the rest of it as well. ■





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May 7/8

International Sauvignon Blanc experts will convene May 7 and 8 for the first Sauvignon Blanc Symposium sponsored by the Lake County Wine Grape Commission and the University of California Cooperative Extension, at the Konocti Harbor Resort & Spa in Kelseyville, CA.

The symposium will feature speakers from Sauvignon Blanc regions, including France, Italy, New Zealand, Australia, and the U.S., particularly showcasing Lake County. Tastings will demonstrate regional styles and characteristics.

Speakers include Lake County winemaker Jed Steele, discussing Sauvignon Blanc wine styles and marketing in the U.S.: winemaker Didier Daugenau, Loire Valley, France, on his stylized approach; and Tony Bish of Sacred Hill Winery on regional styles of New Zealand.

Mike Fisher of Motto Kryla Fisher (St. Helena, CA) will evaluate Sauvignon Blanc as a market category. Dr. Eugenio Sartori of Rauscedo Cooperative Nursery will present Sauvignon Blanc in Italy. Dr. Deborah Golino, director of Foundation Plant Materials Service (Davis, CA), will discuss clones and health of Sauvignon Blanc plant materials.

John Williams of Frog's Leap Winery (Rutherford, CA), Lou Bock of Chance Creek Winery (Ukiah, CA), and Ted Pearson, national sales manager for Adventures in Wine Distributors (Daly City, CA), will participate in a panel on "Sauvignon Blanc Marketing in the 21st Century."

PWV publisher Don Neel will moderate a panel on "Sauvignon Blanc Winemaking in California."

Planned events include: a food and wine pairing demonstration by John Ash and staff, Fetzer Vineyards; dinner featuring Sauvignon Blanc and menu selections showcasing the varietal, (guest chef John Ash); a reception featuring Lake County wines and wines by symposium speakers; a weekend consumer event by local wineries; tours of local wineries and vineyards May 6: and a closing reception and BBQ/catfish fry.

Registration is $275. Discounted lodging is available. For information, contact Shannon Gunier, Lake County Wine Grape Commission: 707/995-3421, fax: 707/995-3618, or email: shannong@lakecountywinegrape.org

Alto Adige and Friuli

What drives Italy's top Pinot Grigio winemaking?

BY Eleanor & Ray Heald
Contributing editors

Global recognition of Pinot Grigio began in the Alto Adige region of Italy in the early 1980s, when the producer Santa Margherita began to buy wine in the region and sell it successfully in the Italian market. By the mid-1980s, Santa Margherita had flooded the home market, and restaurants no longer found it an attractive wine feature.

Development of a U.S. market followed. Success of this varietal from many producers today can only be labeled a phenomenon. It would be a mistake, however, to lump all Pinot Grigio into a single white wine varietal category.

Pinot Grigio is also known as Borgogna Grigio, according to winemaker Giorgio Schiopetto (Schiopetto, Capriva del Friuli). "Like other Pinots," he says, "its origins can be traced to France, and like Pinot Bianco, it originates from a mutation of Pinot Nero [Italian for Pinot Noir]. It produces small, stocky bunches, with rounded, reddish-gray, copper-colored berries at maturity."

Italy's output of over 2,000 wine varieties stands unrivaled by any other country. Its 20 regions are frequently subdivided into six geographic areas and the typical varieties grown there. Pinot Grigio finds its home in the northeast.

This somewhat arbitrary division of the country works well if the main object is simplification. It does not, however, take into account major differences in climate, terrain, or the paternity and psychological disposition of its winemakers. The latter, often dismissed when discussing New World wines, has significant impact on the style of Pinot Grigio, particularly in the Alto Adige and Friuli regions.

Another link encountered in geographic orientation is the hyphenated Trentino-Alto Adige, part of the Adige River valley between the Brenner Pass through the southern Alps to Lake Garda. It serves best as an administrative association rather than a wine connection. Trentino, or more correctly the Province of Trento, is separate from the Alto Adige, better described as the Südtirol or Province of Bolzano.

Mowing a pergola-trellised Pinot Grigio vineyard cover crop in Italy's Alto Adige. (Photo by Ray Heald)

Alto Adige and Germanic influence

Until 1918, Trentino and Alto Adige were part of German-speaking Austria. Trentino easily accepted Italianization while Alto Adige resisted. Evidence of strong association with Austria continues with bilingual signage in both German and Italian. Entire villages speak German exclusively, with Italian a school-learned language, not a native tongue. Pinot Grigio from the region has Germanic influences.

The Alto Adige is one of the richest regions in all of Italy. At a cost of $200,000 per acre, land costs are second only to Burgundy's Côte d'Or.

Alto Adige vineyards form a Y shape, stretching from Bressanone along the Isarco River valley and from Merano along the Adige River, meeting at Bolzano, then continuing south along the Adige River gorge. South-facing vineyards of top producers, farming for low yields, are located in villages south of Bolzano.

Mountain and hillside vineyards have light, infertile, and well-drained topsoils over a limestone base with alluvial deposits of gravel, sand, or clay.

Bud break depends on altitude and can begin at lower elevations as early as the beginning of April, but not until the end of April or early May at the highest elevations. Bloom occurs between May 25 and June 10–15. Veraison begins mid-to-late July, and harvest occurs September 10–25.

Pinot Grigio's tight bunches create the principal viticultural challenge of powdery mildew, black rot, and botrytis. The canopy must be open for air circulation, yet Pinot Grigio requires indirect sunlight on the bunches for best flavor development. Therefore, vines are hedged as necessary and leaves are removed on the morning side of the vines.

Except for the first one or two years post-planting, drip irrigation is unnecessary. There is sufficient rainfall throughout the year. Because reducing vine vigor is the primary goal, there is no fertilizing. Necessary minerals are adequately extracted from the soils.

In attempts to practice ecologically sensitive sustainable farming, a typical pre-bloom to harvest spray program uses only sulfur and copper, limited to 1.3 lbs per acre. Organic sprays have been ineffective. The product SWITCH lessens rot pressures and is considered the best. Until 2000, vines sprayed with SWITCH were not allowed in the production of wine destined for the U.S. market.

Grown at higher elevations between 200m and 900m (656 ft. to 2,950 ft.), Pinot Grigio from the Alto Adige has a stunning, crisp, fresh varietal expression with vibrant aromas, attained only in a climate with significant diurnal temperature variation, approximately between 60ºF and 90ºF in summer. Fermentation in stainless steel is common. Some producers, however, blend in a portion of barrel-fermented and barrel-aged wine.

Successes in Friuli

The hyphenated administrative association of Friuli-Venezia Giulia is most-often referred to as Friuli. Northern borders of the region are also defined by the southern Alps. Chilling winds blowing off them are mitigated by warm winds from the Gulf of Trieste, moderating the climate. Proximity to the Adriatic Sea positively influences the climate by eliminating rapid temperature fluctuations, which are prevalent in the Alto Adige.

Friulian producers in the Collio area, bordering on Slovenia, with allowable production exclusively from hillsides, set the standard for the region's top-quality Pinot Grigio. Also important is the soil, called *ponca,* a calcium-rich, slate-like strata of marl and sandstone.

There is neither a Friulian style nor a Collio style for Pinot Grigio. Differing production philosophies prevail. Light and elegant, near-term drinking wine is contrasted by a fuller, richer style, focused on ageability, where barrel fermentation is considered a necessity. Producers in this latter camp have been significantly influenced by French white winemaking practices.

Viticultural efforts in Collio, where irrigation is forbidden, vary little among producers, except the decision

to train to either single or bilateral Guyot, depending on soil vigor. In either case, the fruiting wire is at 70 cm (28 inches) above ground. Two catch wires, one at 30 cm (12 inches) above the fruiting wire, and another at 40 cm (16 inches), support the canopy. Vines are hedged on the morning side.

Boleslav Princic, vineyard manager for Marco Felluga, explains that the downward-facing bud on the spur position is removed, so leaf pulling is reduced to a minimum and only on the side of the vine receiving afternoon sun. Princic notes that it takes a minimum of five leaves to ripen one bunch, but for safety, having eight leaves is a better choice.

Traditional 1,200 vines per acre planting density is rapidly changing to 2.2m x 0.80m with 2,000 vines/acre.

Approximate dates for budbreak, depending on location and year, are March 20 to April 10, with bloom in May (some years early in the month and others at the end); veraison is in early July with harvest beginning at the end of August to September 10.

Lastly, a strong paternity-derived, Slavic-influenced work ethic, focused thinking, and quality consciousness drive Collio Pinot Grigio production.

Alois Lageder

Alto Adige, Magrè
Alois Lageder, owner
Luis Von Dellemann, winemaker

Benefizium Porer Pinot Grigio produced by Alois Lageder is an excellent example from a single east-facing site, with fairly typical Alto Adige conditions. During the peak growing season in this sloped vineyard at a 750- to 3,000-foot elevation, the average summer diurnal temperature variation is 60ºF to 90ºF. Lageder believes these conditions retain delicacy in the wine, while simultaneously creating structure and body. With uplifted wildflower aromas, the wine is headily perfumed, rich, and creamy, with a long, spicy, fresh fruit finish. Optimal enjoyment, in very good to excellent vintages, is considered to be four to six years.

Benefizium Porer vines, planted east-west and up and down with a 5% to 10% slope, are 20 to 35 years old. The oldest are trained on the traditional pergola system averaging 1,260 vines/acre. Newer vines are Clones 457, 53, 52, and 76 on SO4 and 3309 rootstock. Spaced 1.6 x 0.8m on a single Guyot system, they have a planting density of 3,150 vines/acre. Unirrigated vines have a maximum yield of 3.3 tons/acre (TPA).

"It is very difficult to farm Pinot Grigio biodynamically," Alois Lageder contends. "With tight bunches, the risk of rot is simply too high. If I could adopt bio-organic and biodynamic practices without risking the crop, I would do it. For the first time in 2001, we used pheromones in the village of Magrè to control yellow and red mites."

Physiological maturity, taste, and sugar levels are the most important picking parameters. Typical harvest numbers are 23º Brix, 0.60 TA, and 3.3 pH.

Without the addition of SO_2, approximately 80% whole clusters are pressed in a bladder press. Juice is settled overnight and if the fruit is clean, uninoculated fermentation is encouraged. Eighty percent of the wine is fermented (peak fermentation temperature of 68ºF to 70ºF) and aged on fine lees in stainless steel tanks. This portion is matured for six months in 5,000L Slavonian oak casks.

The remaining 20% is fermented and aged on gross lees, stirred every two weeks, in a mix of one-third new French oak barrels for five to six months. Malolactic fermentation (MLF) completes in most barrels. There is little concern if the tank portion does not undergo MLF.

Fined with casein and albumin, and filtered through a 0.65µ cartridge, the wine is bottled at the end of July following harvest and bottle-aged three months before release.

Franz Haas

Alto Adige, Montagna
Franz Haas, owner/winemaker

Since its founding in 1880, the Franz Haas estate has remained in family hands through the current seventh-

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generation Franz Haas. Vineyards with 30-year-old vines, at 780 feet to 2,600 feet elevation, are located in Montagna, Egna, and the hillside of Cislon. Under Haas' viticultural control, vineyards are either owned by him or a close relative. "This enables us," Haas notes, "to aim for superior grapes, which produce wines with characteristic structure, quality, and longevity."

Each vineyard location, with an approximate 40% slope, has a unique soil profile. One is granite, another limestone, and the third is Dolomite chalk. For great Pinot Grigio, Haas believes fruit sourced from several vineyards with varying soil profiles is important.

Franz Haas Pinot Grigio is opulent and round with balanced acidity. It has the strength of a California Chardonnay without oak presence. Style is derived principally from the vineyards and chosen cellar techniques.

To attain even higher levels of balanced acidity, Haas' newest vineyard is planted at 2,950 feet. He suggests this elevation offers more light, more wind, and growing season diurnal fluctuation (68ºF to 95ºF), without jeopardizing optimal grape maturity at harvest. On a pergola system (see photo), it has 1,600 vines/acre.

Plantings from the mid-1980s, trained either single or bilateral Guyot, are spaced 1.6m x 0.5m with 5,000 vines/acre. However, Haas has experimented with newer plantings of 8,000 vines/acre and considers this better. "Denser plantings than this lead to a less harmonious wine," he says.

Depending on planting density, yields range from 3.5 to 5.25 TPA for diverse clonal and rootstock selections, about which Haas declines to be specific.

A typical harvest window is 20º to 24º Brix, 0.70 to 1.0 TA, and 3.2 to 3.6 pH. In order, the most important picking parameters are vine health, organoleptic ripeness, TA, and pH.

Destemmed grapes (Haas believes that although this cuts yields by 5%, it contributes to overall wine elegance) are pressed with the addition of 20 to 40 ppm SO_2 to the juice. Press yields are 62% to 67% of crop yield.

Juice is settled for 24 to 36 hours at 50ºF or less. In years with clean fruit, uninoculated fermentation is routine. If grapes have significant rot, a cultured yeast is used.

Haas considers diammonium phosphate (DAP) the worst possible yeast nutrient. He uses yeast hulls that are ground to the consistency of wheat germ.

Fermentation is started in tank. On day two, 20% of the volume is transferred to 80% new French oak barrels (the rest are one to three years old). In tank, peak fermentation temperature reaches 75ºF, completing in five to eight days.

MLF is not encouraged. For roundness and textural depth, in both vessels, wine stays on gross lees, stirred twice weekly in barrel, and once a week in tank, for six to seven months until approximately one month prior to bottling. SO_2 levels are not a concern during the lees ageing period.

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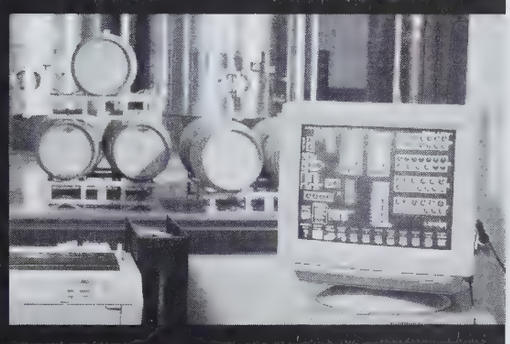

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Bentonite is used as a fining agent. The wine is coarse filtered, approximately 10 to 15 days prior to bottling, in mid-April post harvest.

Elena Walch
Castel Ringberg

Alto Adige, Tramin
Werner Walch, owner
Gian Franco Faustin, winemaker

In 1985, Elena Walch began vineyard replanting with low-yielding, high-quality Pinot Grigio clones such as 457, 53, 52, and 76 on SO4 rootstock. Werner Walch believes that greater planting densities (1.5m x 1m or 3,600 vines/acre) and smaller yields per vine create higher-quality fruit. Therefore, spur-pruned canes on the Guyot training system with the fruiting wire 70cm (approximately 28 inches) above ground are preferred over the traditional pergola.

Winemaker Gian Franco Faustin does not consider Pinot Grigio grape flavors a sound predictor of ripeness. He much prefers to make judgements based on sugar at about 22º Brix, TA at 0.80 to 0.85 with the finished wine target of 0.60, and pH above 3.0.

Routinely, grapes are whole-bunch pressed. Juice is settled overnight at 55ºF to 57ºF, then racked to fermentors for inoculation with a mix of 20 different yeast cultures. Fermentation completes in about one week with a peak temperature of 68ºF.

Two distinct bottlings, Elena Walch Pinot Grigio and Castel Ringberg estate, illustrate the impact of site on other cellar practices. The regular Elena Walch Pinot Grigio is a totally stainless steel production with the goal of about three years ageability. A seven to 10-day fermentation reaches a peak temperature of 68ºF. To tame overt fruitiness, about 30% of the volume undergoes MLF.

Elena Walch Castel Ringberg Pinot Grigio incorporates a 25% fraction that is barrel fermented in new French oak. About half the barrels complete spontaneous MLF. The wine ages in barrel on gross lees, stirred twice each month, for six months. SO_2 levels in barrel are never less than 20 ppm. The tank portion rests on unstirred lees. To assess soundness of the lees, the wine is tasted every three days.

"Compared to 'typical' vineyard sites in the Alto Adige, Castel Ringberg estate is unique," Werner Walch maintains. "At an elevation of about 1,000 feet, it is less influenced by elevation and more by its proximity to Lake Caldaro, where diurnal temperature fluctuations are not as great as in steeper hillside vineyards.

"Peak season heat (63ºF to 88ºF) is like the tropics. Look at the vegetation; there are oleanders and palm trees. The climate creates a fruit profile with lower acidity that can be enhanced by MLF for added creaminess. Ageing this wine on the lees not only ensures a wine with greater body, but a different taste."

Prior to bottling, (Elena Walch in February; Castel Ringberg in April) both wines are bentonite-fined and given a pad filtration.

Peter Zemmer

Alto Adige, Kurtinig
Peter Zemmer, owner/winemaker

Located at the more southern end of the Südtirol, Zemmer illustrates the excellence achieved by traditional tank fermentation and associated techniques for Pinot Grigio. The goal is to produce a wine displaying abundant lime-citrus fruit with pear aromas and flavors. Delicate, yet high-side acidity is complemented by elegant fullness. It is favored by restaurateurs to complement oysters on the half shell and fresh-water fish preparations.

At 820 feet to 1,640 feet elevation, vines averaging 15 to 18 years old are planted using both the pergola system and single Guyot (1.6 x 0.90m vine spacing; 3,200 vines/acre). Yields are

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slightly less than 4 TPA. Vineyards are being transitioned to all single Guyot with a planting density of 3,200 vines/acre.

The oldest vines are the Hauser Clone (H-1), which Zemmer no longer plants. Others in the clonal mix are Geisenheimer 1 and 2, Freiburger 49-207, and San Michele 505-514. All are on SO4 rootstock.

Peter Zemmer explains that to combat diseases after a prolonged rain, a large propeller hooked to a tractor passes through the vineyard to dry the vines. On the other hand, in dry summers, agrichemicals and mineral supplements are delivered through a drip irrigation system. Soil analysis is done every three years to detect mineral deficiencies. Native grass cover crops control soil nitrogen to proper levels.

Harvest parameters for the Zemmer style are approximately 22º Brix, 0.80 to 1.0 TA, and 2.8 to 3.0 pH.

Prior to pressing, destemmed grapes receive four to six hours of skin contact at 50ºF to 54ºF. Juice, with 20 ppm SO_2 added, settles 12 hours at 40ºF before being racked to fermentors and inoculation with various yeast cultures, some intended to elevate the aromatic profile.

In temperature-controlled stainless steel fermentors, peak temperature reaches 68ºF to 70ºF during a seven to 10-day fermentation. The first racking is done at dryness. To inhibit MLF post fermentation, tanks are dialed down to approximately 53ºF. Wine is racked again in another few days and then remains on light lees with SO_2 levels at no more than 10 ppm.

Before bottling at the end of February post-harvest (for the Vinitaly wine show), the wine is bentonite-fined and given two coarse filtrations in addition to being run through a 0.65µ cartridge on the bottling line. The remaining wine is bottled in April post harvest. SO_2 at bottling is 30 to 35 ppm free and never more than 120 ppm total.

MARCO FELLUGA

RUSSIZ SUPERIORE

Collio (Friuli), Gradisca d'Isonzo
Raffaela Bruno, D. SSA, winemaker
Boleslav Princic, vineyard manager

Marco Felluga Pinot Grigio, a blend from multiple vineyard sites, and Russiz Superiore Pinot Grigio, from an estate owned by Felluga, illustrate that referencing a "Collio style" is an error.

Marco Felluga Pinot Grigio is forwardly fruity, with delicate acacia blossom floral aromas, evolving from white flesh fruits to melon and banana, without any over-ripe characters. On the palate, tropical flavors overshadow apple and pear detected in the aroma.

Russiz Superiore, with a slight pinkish/copper color from skin contact, is a site-driven expression of the variety. More floral (wildflower) than fruity, although nuances of tropical fruits can be

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discovered, the wine hints of vanilla in the rich, round, mouth-filling impression.

Only Clone VCRR6, with loose bunches and less prone to botrytis, is planted. Vineyard manager Boleslav Princic believes that quality is linked to place, not clones. And it is far better to use the only loose-clustered clone available and let soil, site, and various cellar techniques create diversity and complexity.

Although all producers have reduced spraying, Princic notes that in the bud-to-bloom period, Mancozebe is used. He attempts to use little or no copper spray because it reduces the aromatics of Pinot Grigio.

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Post flowering, Strobolina, a new bio-organic product, is used against powdery and downy mildew. There is no spraying 30 days prior to harvest.

A typical harvest window for both Pinot Grigios is 22º to 24º Brix, 0.55 to 0.60 TA, and 3.35 to 3.45 pH. "The key decision of when to pick," says Princic, "is the taste balance of acid and sugar in the grapes. I chew the berry skins and when they are no longer astringent, we pick."

To create fuller texture and enhance longevity potential, destemmed and crushed fruit is given four to six (and occasionally up to eight) hours skin-contact at 41ºF to 54ºF. Pressing is done to no more than 1.8 bar.

Fermentation, using about five yeast cultures, different for each lot to achieve aroma diversity, reaches a peak temperature of 68ºF and completes in 15 to 20 days. Essentially, to this point, what has been detailed here is the same for both wines. The differences are that fermentation for Marco Felluga Pinot Grigio occurs in tank, whereas 5% to 10% of the Russiz Superiore is fermented in neutral French oak barrels.

At dryness, 15 to 20 ppm SO_2 is added to the tank-fermented wine, which does not undergo MLF. It rests on light lees until one month before bottling in March and is fined if necessary. It undergoes three filtrations, one pad, an 2.0µ, and then a 0.45µ on the bottling line. Release to market follows in two weeks, and winemaker Raffaela Bruno, D. SSA, suggests that this wine begins to taste very good after six months in the bottle. It is designed for near-term drinking.

The barrel portion undergoes MLF. It remains on gross lees, stirred daily for three to four months, then the regime drops to once per week for the remainder of six to seven months total. This fraction is blended before bottling with a tank-fermented portion from the estate.

"It is amazing," says Bruno, "how a small fraction of barrel-fermented wine adds to the structure of the Russiz Superiore and gives it a longer ageing potential."

VITTORIO PUIATTI

Collio (Friuli), Capriva del Friuli
Giovanni Puiatti, winemaker

The Puiatti family has been active in the Italian wine industry for 30 years.

After a prestigious career with a Chianti producer, Vittorio Puiatti returned to his Friuli roots to open his own winery in Capriva del Friuli, Province of Gorizia. His son Giovanni is now winemaker. Based on fruit origins, Pinot Grigio is made under other Puiatti labels, but the Vittorio Puiatti label with Collio fruit is the focus here.

Typical of the region's close-spaced plantings, vines are trained on a bilateral Guyot system. For years, Puiatti has practiced sustainable viticulture. Natural products in minimal quantities are the only sprays used to combat parasites and other vine diseases.

Winter vine pruning retains only four buds on each side of the vines, hedged in summer. Most important to Puiatti is green harvest at veraison to ensure grape maturity. Giovanni prefers to speak not in terms of harvest parameters, but targets for the finished wine of about 12.5% alcohol and 0.52 TA.

Cellar practices include straightforward, temperature-controlled stainless steel fermentation, no MLF, and no barrel ageing. Aromatically, the wine has fresh citrus, pear, and apple aromas that are well-mirrored on the palate. It finishes bone-dry, crisp, and refreshing.

To expand his winemaking philosophy, Puiatti asks, "What is being aged, the method or the wine?" He answers his own query, "Immediately following woman's discovery of the apple tree, man discovered the oak tree. And as a result, he decided that it could function perfectly as a container for wine. Since those times, the maturation of wine in oak barrels has been the dominating method for ageing quality wines. Even today, many fine wines are aged this way.

"Perhaps this is because tradition says that nothing can substitute for the rich flavor of oak. Fine. Welcome to the Third Millennium. And also to the Puiatti Family. Taste the wines that broke with tradition!

"We believe that nothing substitutes for the intense aromas of a grape like Pinot Grigio, and our practices bring out the true intensity and character. Then, we let our wines mature slowly to bring out their true essence, in temperature-controlled stainless steel 'barrels,' instead of oak.

"This means our wines obtain elegance from their own characteristics rather than from external origins. All great grapes are different. They should produce different wines."

SCHIOPETTO

Collio (Friuli), Capriva del Friuli
Giorgio Schiopetto, winemaker
Stefano Menotti, winemaker

Schiopetto Pinot Grigio has good structure and offers interesting aromas of exotic fruits, pineapple, and banana.

Of French origin, Clone 54 is planted on the 10% hillside slopes of

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Schiopetto vineyard sources, along with Italian Clones VCRR6 and VCRR8. Because it is believed to offer a more balanced vine in these vineyards, bilateral Guyot is the chosen training for all newer plantings. Each cane has four spur positions, whereas a single Guyot has six. The spray program is similar to that used at Marco Felluga's vineyards.

Harvest parameters are about 22º Brix, approximately 0.59 TA, and 3.4 pH. Picking is made principally on skin flavor, without vegetative qualities and astringency.

Whole clusters are pressed without SO_2 addition. Micro-oxygenated must is settled in tank for three to four hours at 64ºF to 66ºF. Yeast cultures from native vineyard yeast populations that offer unique characters to the wine are used for a seven-to-eight-day fermentation, in which peak temperature reaches 68ºF.

Since MLF is not desired, at dryness the wine is racked once and given a 30 to 50 ppm SO_2 addition. It remains on light lees, stirred twice weekly for five months.

Pre-bottling in May or June, the wine is fined with bentonite and filtered through a 1.5µ filter then a 1.0µ on the bottling line. Winemaker Stefano Menotti says optimal drinking is after one year of bottle ageing.

Summary

Pinot Grigio is a complex white variety, carrying multiple vinous faces and a wealth of beliefs on how it best expresses itself, based on site and the psychological disposition of its winemakers. ■

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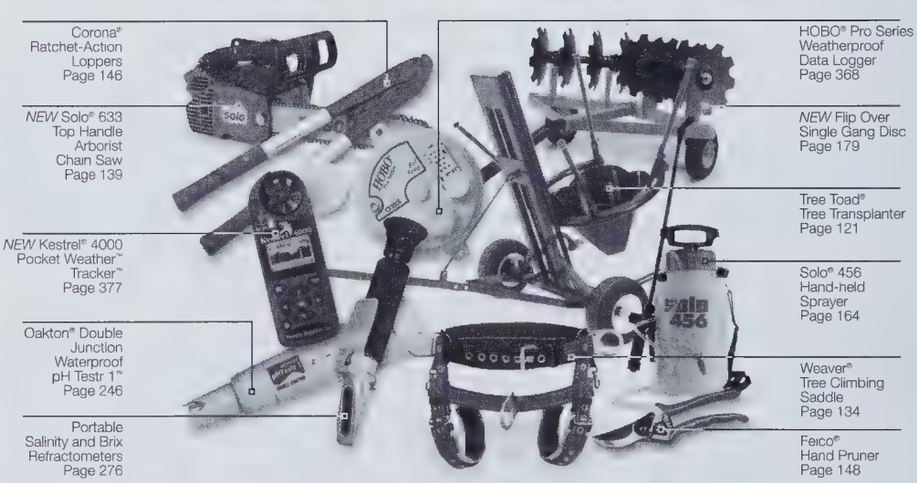
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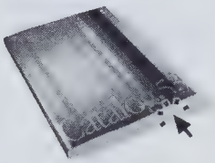
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Fresno State to host Barrel Symposium

Fresno State University's Satellite Student Union will be the site of a Barrel and Barrel Alternatives Symposium on May 6–8, 2002. The event will be hosted by the university's Viticulture & Enology Research Center (VERC) and its Department of Viticulture & Enology.

The symposium will feature national and international authorities discussing the importance of oak in the winemaking process. Technical presentations, panel discussions, and educational wine tastings are included in program activities. There will also be a tour of the university's winery, followed by a reception in the new barrel room.

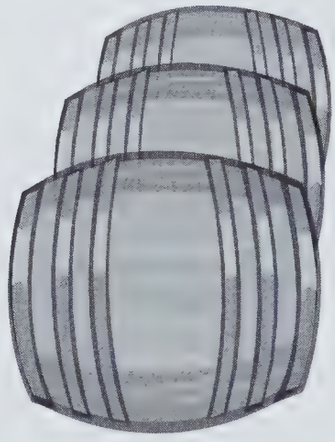
The program will also allow time each day for participants to visit industry sponsor exhibits in the Satellite Student Union.

"We believe that programs such as this play a crucial role in the continuing education of our winemakers," says Ken Fugelsang, professor and winemaster at Fresno State. Fugelsang is on the organizing committee, along with colleague Barry Gump, professor of chemistry. They expect more than 250 participants from California and other wine-producing states.

"We have a great line-up of speakers from all over the world — Europe, Australia, the midwest, and California — to provide an exceptional balance of research-based and practical information. The industry and winemaker panels will provide unique opportunities to complement the technical information," says Gump.

Registration and exhibits will begin at 11 AM on May 6 with lunch and the keynote address on the use of oak in developing flavor and structure by Dr. James Swan of Tatlock & Thomson, an independent UK-based international consultancy. Swan's areas of expertise include maturation in oak wood, product quality, blending and sensory evaluation. His presentation is being sponsored by World Cooperage.

Following Swan, three foresters will discuss management of oak forests. Jimmy Beteau, technical director of Boise' France, will discuss *terroir* and its implication in oak extraction as it relates to French oak forests. Dr. Tom Schmidt, U.S. Forest Service research scientist in Minnesota, and Dr. Lynn Barnickol, forestry program supervisor for the Missouri Department of Conservation, will discuss similar issues relating to North American oak forests.



A cooper's panel, moderated by Ed Schultz of Barrel Associates International, will review how coopers utilize their experience and skills to select oak wood and produce quality barrels. Panel members are: Phil Burton (Barrel Builders, Healdsburg, CA), Steve Tillman (Mendocino Cooperage, Hopland, CA), and Henry Work, (cooperage consultant, Calistoga, CA).

After the technical session, participants will adjourn to the university's winery on campus for a reception and grand opening of the new World Cooperage Barrel House.

The Tuesday, May 7, session begins at 7:30 AM with Dr. Andrew Waterhouse, professor of enology & viticulture at UC Davis, discussing the effects of toasting versus tannin and volatile composition in wood cooperage.

A red winemaker's panel moderated by Don Neel, publisher of ***Practical Winery & Vineyard***, will review creative uses of barrels in the development of wine styles. Jeff Cohn of Rosenblum Cellars (Alameda, CA), Jim Moore of Uvaggio D'Giacomo (Napa, CA), and Fred Scherrer of Scherrer Winery (Sebastopol, CA) will participate. The program will include tasting of selected red wines.

Dr. James Vahl and Leighton Richards of the Winemaker's Database will discuss barrel tracking and management tools. Dr. Christian Butzke, UC Davis cooperative extension enologist, will discuss barrel sanitation. Butzke will also moderate a panel examining the use of ozone in winemaking.

On Wednesday, May 8, the symposium will focus on barrel alternatives, oak enhancements, texture profiling of red wine, and management and practical issues of wine microoxygenation.

Dr. Jeff McCord, of StaVin (Sausalito, CA), will review barrel alternatives, followed by a panel of Brian Geagan, Xtra Oak (Santa Rosa, CA), Bob Rogers, Innerstave (Sonoma, CA), and Steve Passagno, Lockwood Winery (Lockwood, CA).

Dr. Richard Gawel, director of Recognose PL in Australia, will discuss the usefulness of sensory profiling in quantifying the "in-mouth" textural characteristics of red wine. He will review use of the technique in both applied enological research and in understanding the role of tannin composition on wine texture.

The Piccadilly Inn University is offering a special discount rate of $72 plus tax per night on lodging for conference attendees. Advance reservations are required by April 15.

The preregistration fee of $350 per person includes admission to all sessions, refreshments, two lunches, the May 6 wine reception, and program booklet. Preregistration deadline is April 15. Late and on-site registration fees are $400 per person.

A special discount price of $320 per person will be honored for additional attendees from one company who register by April 15. Students with a valid identification card can preregister for $100 per person ($200 for late and on-site registration). Check or credit card (Visa or MasterCard) are accepted.

For online registration forms and program information, contact 559/278-2089 or go to the Viticulture & Enology Research Center's web site at http://cati.csufresno.edu/verc. For sponsorship details, contact Cynthia Wood at cynthiaw@csufresno.edu or visit the web site. ■

PW
PRACTICAL WINERY & VINEYARD
MARCH/APRIL 2002

VINEYARD SHOWCASE

EQUIPMENT

tractors, tillers, mowers, sprayers, spreaders, harvesters, hedgers, drip irrigation, trailers, wind machines, sprinklers, weather stations

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Toyota Material Handling

Toyota Material Handling introduces its newest generation Electric Pneumatic Counterbalanced Forklift, the 7FB.

It is the wine industry's first electric forklift to harness the benefits of AC power and Toyota's exclusive system of active stability (SAS). With AC power, the 7FB's performance rivals most internal combustion units. A breakthrough in innovative design, the 7FB not only boasts a sleek new look, but also unparalleled operator comfort. The 7FB offers a capacity range of 3,000 to 5,000 lbs., and is a major leap in the evolution of electric forklift design.

Toyota's revolutionary new, compact AC-lift and drive motors deliver high performance and smooth control.

The compact, yet powerful AC motor provides greater torque and acceleration than similar trucks with DC motors. Operators accustomed to DC-powered trucks and the lag time which occurs when shifting from forward to reverse, will find there is no lag time with an AC-powered forklift. It has excellent gradeability: "Loaded or unloaded, the AC truck delivers an optimum level of performance," says Adam Hughes, TIE electric product planning manager.

Because its performance approaches that of an engine-powered forklift, the 7FB can work in a broad range of applications and has the added benefit of zero-emissions.

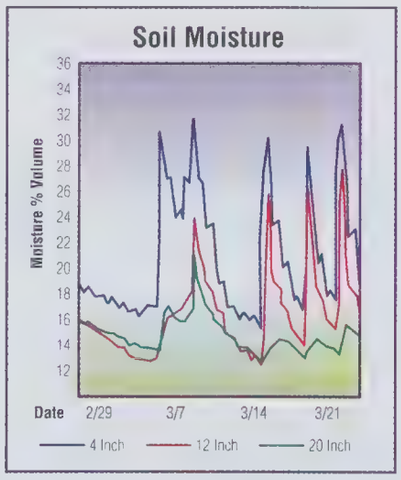
For more information, contact:
Toyota Material Handling
31010 San Antonio St., Hayward, CA 94554
tel: 866/TMH-LIFT; fax: 510/675-0400
e-mail: info@tmhnc.com
website: www.tmhnc.com

PLEASE SEE TOYOTA MATERIAL HANDLING'S AD, PAGE 37.

Netafim USA

"Automation solutions from Netafim USA — designed to put you in control."

GroPoint, Netafim USA's, cost-effective soil moisture sensor provides accurate measurement of soil moisture by volume — with continuous graphs that respond immediately to moisture changes. Designed to remain in the soil permanently or seasonally, sensor probes are factory-calibrated for agricultural soils and crops. Stainless steel and waterproof, this unit is rugged, easy to use, and maintenance-free. For higher yields, better quality crops, and optimizing water usage, get the GroPoint Soil Moisture Sensor.



Graphs of soil moisture — percent by volume — over a period of time, three different probes monitoring three different depths.

Netafim USA's new PC-based irrigation control and monitoring system provides continuous sensor-monitoring and delivers quick response to adverse weather or irrigation events protecting crops and irrigation systems. For monitoring by wire connections or radio, this system controls pumps, valves, filters, soil moisture, and water levels.

Additional features of Netafim's Intelligent Control Systems include: easy-to-use graphic interface; modular design with radio options; flexible irrigation programming; and manual, semi-automatic, or fully automatic operation. Netafim USA's irrigation control and monitoring system improves crop quality and production.

For more information, contact:
Netafim USA
5470 E. Home Ave., Fresno, CA 93727
tel: 559/453-6800; fax: 559/453-6803
e-mail: rhall@netafimusa.com
website: www.netafimusa.com

Showcase of Vineyard Supplies

Nursery Material
Soil Amendments
Trellis Supplies
Laboratory Analysis
Fertilizers
Cover Crop Seed
and more
in the upcoming
September/October 2002
PWV magazine.
Reserve space now!
Deliver your
product/service information
directly to your potential
customers:
PWV readers.
Call 415/479-5819

Bird Gard/JWB Marketing

Bird Gard/JWB Marketing sells the Bird Gard PRO series of digital, distress-call bird repellers. There's a model for three acres, one for up to six acres, and the MEGA PRO with a 200-watt amplifier and 20-speaker tower that covers up to 40 acres.

The Crop Gard PRO series uses harassment sounds for tough birds like linnets, mocking birds, and high-pressure from starlings and robins. Like the Bird Gard, there's a model for three acres, one for up to six acres, and the MEGA PRO with a 200-watt amplifier and 20-speaker tower that covers up to 40 acres. When combined, the two systems achieve results comparable to netting.

Bird Gard/JWB Marketing's exclusive visual scare product is the Scare Windmill. It uses a unique uv-light-reflecting paint on the blades to repel birds in a two-acre area. Recently, it was discovered that one-half of a bird's vision is within the uv-light range. The movement of the blades in the wind looks, to the birds, like the commotion of a flock of birds taking off in fright, which causes a chain reaction.

For more information, contact:
Bird Gard/JWB Marketing
101 Hurlbut St., Westwood, NJ 07673
tel: 800/555-9634; fax: 201/666-7581
e-mail: birdgard@ix.netcom.com
website: www.birddamage.com

Central Valley Building Supply

"CV has been a partner with the vineyard industry since the beginning," says Kathleen Patterson, president of Central Valley Building Supply (CV), "and we have grown into one of Northern California's major suppliers for vineyard products and equipment."

The CV Ag Department carries a huge assortment of vineyard supplies, including: trellising and irrigation supplies, fencing, grow tubes and tie-offs, pruning shears, and other supplies. For a complete list of vineyard products, visit their website: www.cvbsupply.com

In 1955, Robert E. "Pat" Patterson, Jr. and his wife Evy, purchased CV in St. Helena, CA to provide quality supplies and unmatched service to their customers.

In 1973, Robert Patterson, Jr. took over the business and continued to pursue his parents' goal. This dedication was reflected in the steady growth through the next 20 years into three current locations in Napa, St. Helena, and Woodland, CA.

CENTRAL VALLEY
BUILDERS & IRRIGATION SUPPLY
AGRICULTURAL DIVISION

After Bob's death in 1992, his wife Kathleen became president. The third generation of Pattersons joined the Central Valley Builders Supply team when Bob and Kathleen's son Steve became general manager at the Woodland facility.

For more information, contact:
Central Valley Building Supply
1100 Vintage Ave., St. Helena, CA 94574
tel: 707/967-4300; fax: 707/963-8952
website: www.cvbsupply.com

PLEASE SEE CENTRAL VALLEY'S AD, PAGE 6.

PELLENC America, Inc.

PELLENC America, Inc., offers a full line of Precision Viticulture™ machines, and grape harvesters with the Pellenc Smart System picking head.

There is a choice of stainless steel bins or side discharge conveyor and also a wheel-assist, tow-behind model. The multifunction tractors are factory-designed to receive different specific implements such as pre-pruners, wire lifters, trimmers, two- or four-row sprayers, spreaders, and more. Any attachment can be put in or out by only one man in less than 20 minutes.

The unique Smart System allows adjustment of the frequency, pinch, amplitude, and acceleration from the comfort of the cab.

This year, a new, under-the-row cultivator (requiring no sensor) is available. Named "Tournesol" (sunflower, in French), this implement cultivates the ground two-inches deep or cuts grass on the surface. Its unique design allows the "Tournesol" to work within one inch of the vines.

Parts and service are available in Santa Rosa, CA and other locations.

For more information, contact:
PELLENC America, Inc.
1042 Hopper Ave., Santa Rosa, CA 95403
tel: 707/568-7286 or 888/PELLENC
fax: 707/568-7369
e-mail: pellencus@msn.com
website: www.pellenc.com

KLR Machines

KLR Machines offers vineyard trailers manufactured by STHIK.

Located in the Cognac region of France for more than 20 years, STHIK has grown to become the largest manufacturer of lift trailers in France dedicated to grape harvesting. Recently, several U.S. wineries have shown an interest in the STHIK lift trailer.

Everything from engineering to the final precision weld is done by STHIK to construct efficient, well-designed trailers.

STHIK takes pride in the engineering of the combination of a patented hydraulic lifting frame and well-designed bin. The hydraulic lifting frame raises and lowers its load to the required height without compromising stability. In order to easily load the grapes, each model has been designed with the lowest clearance possible. STHIK trailers can hold from two to seven tons of grapes and are manufactured to match the needs of quality-focused vineyards.

The most popular EVO trailer (see photo), has a stainless steel bin combined with an oversized slow-rotating screw to reduce grape damage. This STHIK trailer delivers grapes to inspection tables, destemmers, or presses with heights up to 9.5 feet, due to its adjustable hydraulic frame.

For more information, contact:
KLR Machines
350 Morris St., Ste. E, Sebastopol, CA 95472
tel: 707/823-2883; fax: 707/823-6954
e-mail: klrmach@pacbell.net
website: www.sthik.com

PMS Instrument Company

Regulated deficit irrigation (RDI) has been receiving increased attention from premium winegrape growers — and with good reason. RDI can increase fruit quality and control canopy vigor. The purpose of RDI is to withhold irrigation water to create a

water deficit and thus build water stress in the vine. This stress can be measured with the Pressure Bomb, otherwise known as a Pressure Chamber.

The Pressure Bomb takes a water-stress reading directly from a vine leaf. At mid-day, the instrument is carried into the vineyard for readings. A plastic sandwich bag is placed around a fully expanded leaf exposed to the sun. Next, the leaf is cut from the vine and immediately sealed into the chamber with the stem protruding through the lid. The chamber is then pressurized until plant water is pushed to the exposed surface of the stem. The pressure required to do this is called "Plant Moisture Stress." Irrigation is then scheduled based on this measurement.

The Pressure Bomb (in photo) is the Model 610, which is one of PMS Instrument Company's most popular instruments for winegrape growers. Additional models with different features are available.

For more information, contact:
PMS Instrument Company
480 SW Airport Ave., Corvallis, OR 97333
tel: 541/752-7926; fax: 541/752-7929
e-mail: info@pmsinstrument.com
website: www.pmsinstrument.com
PLEASE SEE PMS INSTRUMENT'S AD, PAGE 55.

Equipment That Works!

The Vineyard Auger is designed to mount on the side of a tractor and be operated from the tractor seat. It operates on eight gallons of hydraulic fluid per minute yielding 350 lb/ft of torque at 2,000 psi and drills a nine-inch diameter hole 12 inches deep.

The unit is available in two boom lengths. The short boom is 32 inches long with an extension of 12 inches and a total reach of 44 inches. The longer boom has a 40-inch stowed length with an extension of 18 inches for a total reach of 58 inches. Choose the length to match your vine row and tractor width.

Vineyard Augers are in use from Oregon to Georgia, California to New York. They can be operated from almost any tractor with adequate hydraulic flow. One user has it mounted on a crawler tractor in the center of the blade mount on a pivot so that the unit can work on either side of the tractor.

The standard package includes a nine-inch diameter, 12-inch long auger mounted on a boom that will stow within the track of the tractor. The package also includes a three-section control valve that mounts on the floorboards of your tractor or on a platform extension if the tractor is too narrow for both operator and valve control. Up to 250 holes per hour have been reported. Literature is available upon request.

For more information, contact:
Equipment That Works!
tel: 800/242-4479; fax: 913/677-4614
PLEASE SEE EQUIPMENT THAT WORKS' AD, PAGE 40.

Sutton Agricultural Ent., Inc.

Birds cause extensive damage every year. This depredation may range from crop losses to health and safety hazards, but is especially prevalent in ripening grapes. By using a combination of Sutton Ag's bird control products, it is possible to minimize or completely control these losses.

The key to any pest control program is variety — employing different methods, alternating the duration or time of day used, relocating the devices, etc. Sutton Ag's bird control products can significantly reduce damage caused by pest birds and protect your grapes.

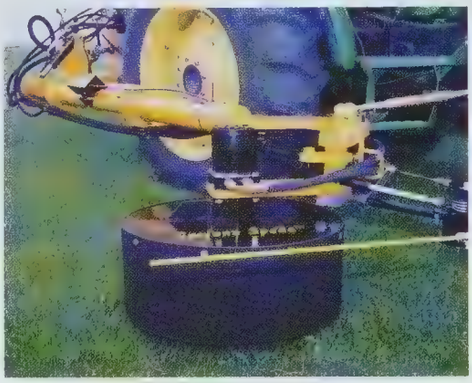
Sutton Ag is the exclusive distributor of Bird Bombs®, Bird Whistlers®, and Zon Propane Cannons in the U.S and carries a wide variety of sonic and visual devices including: BirdGard distress cries, Bird Baffler™ Reflective Tapes, Rainbow™ Tape, Bird Baffler™ Revolution, etc. Sutton Ag also specializes in premium (reusable) and disposable-grade Bird Control Netting to completely protect your crop from pest birds.

For your seasonal problems, Sutton Ag offers a rental program for Propane Cannons and Bird Gard Super Pro.

For more information, contact:
Sutton Agricultural Ent., Inc.
746 Vertin Ave., Salinas, CA 93901
tel: 831/422-9693; fax: 800/482-4240
e-mail: suttonag@earthlink.net

Weed Badger Division

Since 1979, Weed Badger Division has manufactured a full line of rugged, commercial-duty hydraulic rotary vineyard tillers and mowers. More than ten upgradeable Weed Badger models are cost-effective tool carriers for a variety of attachments including the Model 3875 Mower, Sweeper/Tiller, Badger Broom, Cyclone Spade, and many more.



Weed Badger's high-speed precision, in-row rotary tillage is an economical alternative to chemical weed control, hand labor, or flaming. It is the only tool of its type to kill big weeds while conditioning and aerating soil resulting in optimum water penetration. Weed Badger vineyard model machines hill-up and hill-down soil and incorporate soil amendments while controlling weeds.

The Weed Badger kills all weeds including Johnson and Bermuda grass and tough, herbicide-resistant weeds and eliminates hassles, risks, and liability concerns for potential exposure involving workers, area residents, and growers nearby. Eliminate the trash habitat under canopies where disease-carrying insects and rodents reside over winter. The Weed Badger is a top choice for grapegrowers, IPM programs, organic growers, and research centers.

Take advantage of Weed Badger Division's excellent factory-direct service and discounted prices. Call 800/437-3392 or send an email to weedbadg@drtel.net today and ask for a free video or visit the website at www.weedbadger.com.

For more information, contact:
Weed Badger Division
Town & Country Research & Development, Inc.
5673 SE 95 Ave., Marion, ND 58466
tel: 800/437-3392 or 701/778-7511
fax: 701/778-7501

PLEASE SEE WEED BADGER'S AD, PAGE 9.

Growers Supply & Irrigation, Inc.

Growers Supply & Irrigation, Inc. has been servicing the north end of Sonoma County from its Geyserville location for over 40 years. Third generation owners, Kevin and Susie Hare, are active in day-to-day operations.

Kevin is a Certified Drip Irrigation Designer, certified by the International Irrigation Association. He has been involved in the design aspect of the business for over 20 years and takes a hands-on approach to every project. He is involved from the planning through design, using state-of-the-art, computer-aided design packages to ensure each system is tailored to the resources available. His past experience in installation helps in troubleshooting customers' needs.

Susie handles the retail end of the business, which is also an Ace Hardware store. Product lines are geared to ranch and farming supplies, but many homeowner products are also available.

Growers Supply prides itself in carrying the best products available by distributing PW Pipe, Netafim Irrigation, Hardie/Toro Irrigation, Rainbird and Nelson Sprinklers, Advanced Drainage Systems, Agricultural Products, and more. Come by and see what is available.

For more information, contact:
Growers Supply & Irrigation, Inc.
Kevin and Susie Hare
20750 Geyserville Ave.
Geyserville, CA 95441
tel: 707/857-3484; fax: 707/857-3132

PLEASE SEE GROWERS SUPPLY & IRRIGATION'S AD, PAGE 73.

Patchen, Inc.

Saving money on chemicals and labor are the main reasons why leading growers use the WeedSeeker® Selective Spray System to control weeds in their vineyards. It sprays only weeds, not bare ground or dirt, reducing chemical use up to 80%.

While most vineyard sprayers operate at five to six miles per hour, the WeedSeeker® sensors are designed to spray at speeds up to 10 mph. One operator with a WeedSeeker® Vineyard System moving twice as fast down the tractor row as a conventional two-man crew spot-spraying is incredibly more cost-effective and efficient.

The WeedSeeker® Vineyard system is easy to use and can be mounted on ATVs, tractors, and a variety of utility vehicles. The sensors are mounted under hoods on a spray boom to protect the vines from drift and can be used to spray berms and middles.

Patchen, Inc. is an agricultural technology leader offering growers worldwide one of the most exciting solutions available to the age-old problem of weed control.

For more information, contact:
Patchen, Inc.
740 S. State St., Ukiah, CA 95482
tel: 888/728-2436; fax: 707/467-3750
e-mail: www.info@weedseeker.com
website: www.weedseeker.com

PLEASE SEE PATCHEN'S AD, PAGE 19.

Terra Spāse

Terra Spāse, Inc., a leading provider of information and technology to the winegrape industry, offers a full suite of equipment to assist vineyard professionals in establishing irrigation management programs to enhance production of premium quality fruit.

The company's technology includes equipment to measure on-site weather, soil moisture and vine water status, and vine canopy density. Terra Spāse's information includes near real-time North Coast weather data and vineyard specific maps of vine water status, soil moisture-holding capacity, and vine canopy density.

Terra Spāse also offers the latest technologies for monitoring weather and soil moisture status on a near real-time basis in vineyards, including C-probes and watermark sensors. Vine-based water status measurements are produced using the latest pressure chamber and infrared equipment. Soil moisture holding capacity maps are produced using Terra Spāse's Terroir Analysis program.

Weather data information for Napa and Sonoma counties (frost forecasts, weather and disease risk maps, individual weather station data, and weather and disease forecasts) will be available online at www.terraspase.com on March 1.

Terra Spāse is the exclusive online provider of Fox Weather, LLC weather products for the North Coast of California including: Satellite Rain Analysis, 10-day agricultural forecasts, 30-day weather outlooks, disease weather forecasts for botrytis and powdery mildew, detailed quantitative precipitation forecasts (which provide probability of expected rainfall), and graphical moisture analyses from the SSM/I microwave satellites.l.

For more information, contact:
Terra Spāse, Inc.
345 LaFata St., Suite D,
St. Helena, CA 94574
tel: 707/967-8325; fax: 707/967-8596
e-mail: terraspase@earthlink.net
website: www.terraspase.com

Ag Industrial Manufacturing, Inc.

Ag Industrial Manufacturing, Inc. (AIM) offers the GH-9000 self-propelled grape harvester with an FMC picking head. With over 28 years of custom harvesting experience and 21 years of retrofitting the FMC head into other harvesters, AIM has designed its own machine, with 13 years of field operation.

The heavy-duty harvester chassis has a structural steel tube frame. All-hydraulic leveling includes 38 inches side-to-side (equivalent to 30% plus side slope). The harvester will work on 25% up/down slope (in direction of travel) and the front/rear pitch can be adjusted independently. The sharp steering angle permits easy turns at the end of vine rows.

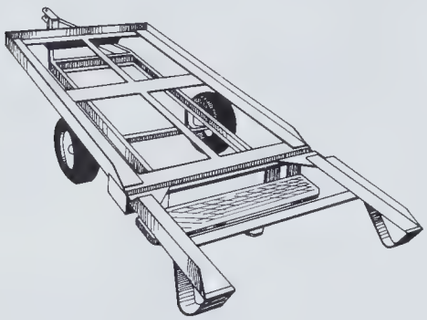
The FMC picking head provides excellent picking quality, with very low MOG. There is some selectivity between raisins, rot, second crop, and good quality berries. Its effective shaking action is due to 8-foot long rails and a variable stroke that becomes more intense as the vine progresses through the machine. The FMC head is lightweight (approximately 1,000 lbs.), self-centers on the vine row due to a balanced, free-floating design, and is inexpensive to maintain. On average, it can harvest for one season of 600-700 acres without major maintenance.

AIM also offers: vine lifting and tying machines, vine trimmers, semi-automatic pre-pruners (see cover photo), and vineyard brush rakes, all tractor-mounted.

AIM custom-designs and fabricates all types of harvesting equipment, gondolas for grapes, ring rollers, applicators, twin-bin picking trailers, and the "Sonoma Leafer," a patented leaf-removal system using super-heated steam.

For more information, contact:
Ag Industrial Manufacturing, Inc.
PO Box 53, Lodi, CA 95240
tel: 209/369-1994

Western Square Industries



Western Square Industries manufactures vineyard bins and trailers and wine barrel racks.

Western Square's vineyard bins are manufactured in mild and 14-gauge stainless steel and the two-ton bins feature lap welds for better strength. The channels on the outside of the rail are blocked to prevent the hooks of the gambrel from catching. The D-ring end is ribbed so that the stress of hoisting a full bin is spread over the entire height of the bin, not just the D-ring itself. Sides, end walls, and bottom sections are lapped so that welds are on flat surfaces, not on edges or corners.

Western Square two-ton bins have the strength and dimensional stability needed for years of trouble-free use, but without added weight. All mild-steel bins are powder coated, a process of coating steel that provides better corrosion resistance than conventional painting methods. The inside of the bins are coated with FDA-approved food grade epoxy powder coating.

All Western Square products are manufactured in America. For more information, call Trygve Mikkelsen at 209/944-0921.

For more information, contact:
Western Square Industries
1621 N. Broadway, Stockton, CA 95205
tel: 209/944-0921 or
inside CA: 800/367-8383
outside CA: 800/367-7810
website: www.westernsquare.com

PLEASE SEE WESTERN SQUARE'S AD, PAGE 27.

Aquifer Exploration Co.

Aquifer Exploration Company provides groundwater determination and evaluation by Magneto-Telluric Data Acquisition.

The company has developed a merging of magnetic and telluric geophysical data. Readings are taken of the earth's natural magnetic fields and radio waves along with groundwater geology to successfully identify the presence of groundwater, its depth, and productive possibilities.

AQUIFER®
EXPLORATION COMPANY L.L.C.

This is accomplished by: 1) Dividing the tract of land into a grid pattern that will allow Aquifer to effectively gather data for analysis and interpretation by its team of geologists and engineers; 2) A non-invasive tool carried by Aquifer's technicians is placed on the surface and a reading is acquired for that data point. Each reading takes 15 to 20 minutes; 3) Once sufficient data to evaluate the property (as determined by Aquifer geologists) has been acquired, the information is processed and interpreted at the laboratory.

This processed data, along with interpretation, forms the completed evaluation of groundwater potential and location. A complete survey report, which is the basis of a drilling setup, is then delivered to the customer.

Aquifer's technology is proprietary and the success-rate for productive wells based on the company's data is high and documented.

For more information, contact:
Aquifer Exploration Co., LLC
Dick Dee
1240 Spring St., St Helena, CA 94574
tel: 707/963-5311; fax: 707/963-5845

PLEASE SEE AQUIFER EXPLORATION'S AD, PAGE 18.

Weitech, Inc.

Weitech's Bird Gard® and Crop Gard® line of products are a cost-effective tool for your integrated pest management arsenal. Weitech's technology is a humane way to drive birds away from agricultural sites. Independent university and grower testing have proven Weitech technology to be a highly effective and safe form of bird control.

Bird Gard® BY WEITECH

Each Bird Gard unit features a combination of completely programmable audible bird distress and predator calls. Different chips accommodate various needs based on the specific species of bird sounds. Bird Gard technology produces crystal-clear, digital playback and random features to enhance performance. Each unit and speakers are manufactured to high-quality standards to withstand years of outdoor use to protect areas from ¼-acre up to 40 acres in size.

Crop Gard® BY WEITECH

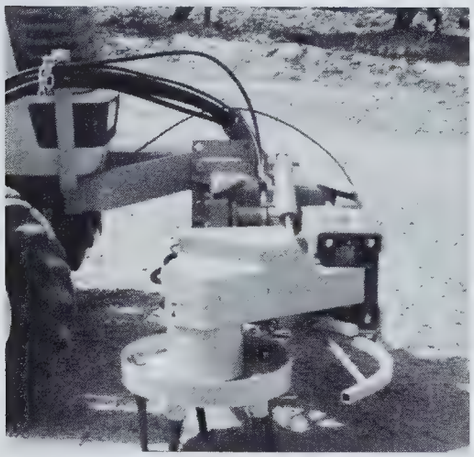
Crop Gard products repel birds by broadcasting audible harassment sounds. These artificially generated sounds irritate birds and block their ability to communicate. The Crop Gard is an ideal solution for large commercial agricultural sites such as vineyards.

All units carry an unconditional satisfaction warranty.

For more information, contact:
Weitech, Inc.
601 North Larch St.
Sisters, OR 97759
tel: 888/332-2328; fax: 541/549-8154
e-mail: info@birdgard.com
website: www.birdgard.com

Kimco Mfg., Inc.

Mechanically removing weeds from narrow-row vineyard plantings is no longer a problem. Kimco Mfg., Inc. has introduced a heavy-duty, in-row tiller that can operate in vine rows as narrow as four feet wide.



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Importance of soil texture

Continued from page 29

Texture will also influence soil fertility.

For instance, a coarse sandy soil is easy to till, has plenty of aeration to stimulate root growth, and is easily irrigated. However, this same sandy soil will rapidly dry out after irrigation due to its low water holding capacity. Water soluble plant nutrients (like nitrates and potassium) will be rapidly leached below the vine root zone by percolating waters.

In contrast, moist clay soils (over 35% clay) are composed of very small particles that fit tightly together with fewer large interconnected pores. Clay soils should be irrigated less frequently than sands, but with higher amounts of water and over longer periods of time. Most clay soils have greater cation exchange capacities (CEC) and will adsorb higher amounts of water-soluble plant nutrients (especially potassium, calcium, and magnesium). Wet clay soils are also difficult to till due to their relative stickiness and inability to support the weight of a tractor.

Summary

For most intensive vineyard management operations, a detailed soil map should be prepared to supplement the more general USDA soil survey reports. The soil textures for each soil layer should be identified for the dominant soils using the standard USDA terms defined here.

When describing soil textures within a vineyard, it is important to not only identify the soil textural classes but also the soil parent material rock types and the amounts of rock fragments within the soil profiles. Related soil properties like saturation percentage should also be determined to aid in irrigation system design.

Soil texture information should also be supplemented with data regarding soil organic matter content and soil chemical properties, such as pH and plant essential nutrient concentrations. Soil organic matter and humus contents (highly decomposed organic matter) will modify the general effects of soil mineral texture (Table V) by enhancing soil structure formation, increasing soil water holding capacity, and increasing CEC. The complex interrelationships among all these soil properties should be considered when vineyard management decisions are made. ■

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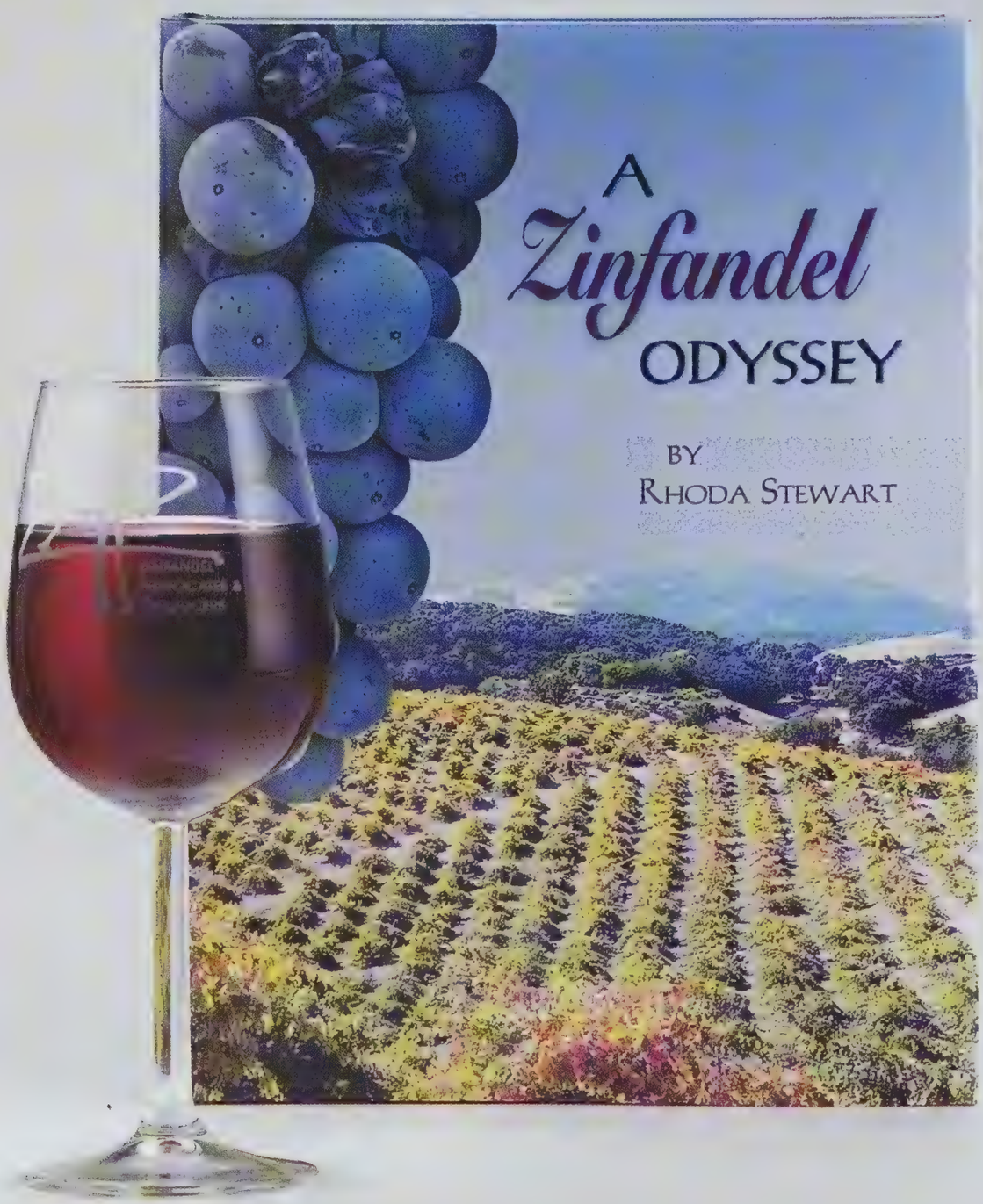

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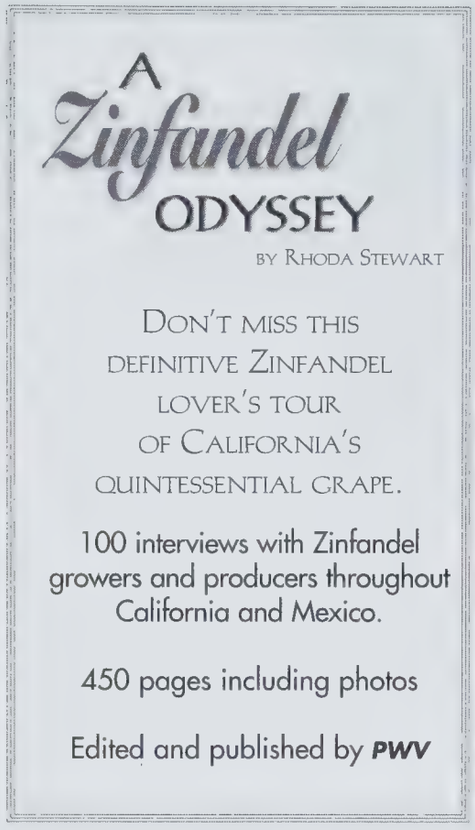
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Zinfandel growers answer the irrigation question

BY Rhoda Stewart

Water delivery for grapegrowing historically has been strictly from Mother Nature's cloud-laden skies. Reliance on such heaven-sent annual rainfall is known as dry farming. Such naturally occurring water usually has been adequate, if not abundant, in most regions of California.

Zinfandel vines, whether on St. George rootstock or propagated from rooted cuttings, are good at extracting water from the ground during the dry summer months. The stress of doing so tends to develop more intensely flavored grapes. Zinfandel vines living in luxury do not produce well-flavored grapes.

However, with the high prices being paid for top quality Zinfandel grapes today, and the drain on ground water due to new development, many top Zinfandel growers have installed drip irrigation in vineyards to supplement below average annual rainfall. Many growers who establish new vineyards find drip irrigation essential to help their vines get off to a good start.

In regions where there is sandy soil and a warm climate such as Lodi and Cucamonga Valley irrigation has become necessary to keep vines healthy, grape quality up, and growers in business. According to Craig Rous, former director of research (1979 to 1998) for Mondavi-Woodbridge, and one of that winery's top growers for its red Zinfandel program, "The tool that growers here still use that has the largest impact on quality of Zinfandel is irrigation."

This article is an excerpt of discussions on the topic of irrigation of Zinfandel grapevines by growers and producers interviewed throughout my book, A Zinfandel Odyssey, *published by* PWV *Inc., San Rafael, CA* © 2002.

Asking the right questions

Although some Zinfandel producers look with a jaundiced eye upon irrigated Zinfandel vines, the question to be asked is not whether the vines have been irrigated, argues Rous. Rather, three questions should be addressed:

- How is the water delivered?
- How much water is delivered?
- When is the water delivered?

Vines, after all, need adequate water for healthy growth and consistent, high quality grape production. Dry farming never did mean absence of water.

Mark Shimozaki, another of Mondavi-Woodbridge's top red Zinfandel growers, states, "The dry farming mystique is false. Many regions, including Bordeaux, have abundant annual rainfall. To say that such vineyards are 'dry-farmed' is little more than a romantic misnomer. Non-irrigated, yes, because irrigation would be superfluous. But 'dry-farmed?' Hardly.

"If we get past this false mystique, the question isn't whether or not a grower irrigates. The question is whether the vines are in balance, and do the grapes have the quality? For growers in regions like Lodi, where the soil is sandy, you can't be a serious grower if you don't supplement seasonal rains with some kind of irrigation in the summer months. You can be a 'fun farmer,' and get along on two or maybe three tons per acre, but you can't be a full-time farmer with yields like that. You'd have to have another source of income."

Shimozaki's annual average yield is between six and eight tons per acre of premium quality fruit — enough to afford him a living. He owns 15 acres of head-trained Zinfandel vines spaced 10 feet by 8 feet in Victor, just east of Lodi. Eight acres are 60 years old, and to the best of Shimozaki's knowledge, are on St. George rootstock. In 1989, he propagated seven additional acres with cuttings from the older vines budded onto Harmony rootstock.

From furrow to drip

Furrow irrigation was the early method of water delivery used by Lodi and Cucamonga Valley grape growers in the years following repeal of Prohibition. These two regions are home to many of the state's oldest Zinfandel vineyards, many of them pre-Prohibition.

For today's premium wine production, Shimozaki has converted to drip lines for water delivery. Rous also has equipped his non-irrigated vineyard with drip lines. By changing the delivery system from furrows to drip lines, learning the best time to water, and determining how much water is optimal, growers can bring their vines into balance for premium wine grape production. With such careful application of irrigation, crop size is balanced to the vines throughout the vineyard, and overall grape flavor and color are dramatically improved. Wine quality follows.

Another Lodi grower who relies on drip irrigation to maintain consistency and balance in his vineyard is David Lucas. "These old vines have a root profile that goes down 14 or 15 feet. Our average annual rainfall is 16 to 18 inches, and that's exactly the total amount the old vines need for a two to 2½-ton yield. With drip irrigation, I can dial in exactly how much each vine needs."

Excessive rainfall produces a different problem for Lucas. "I still haven't figured out how to bring a vine into balance in a wet year (more than 16 inches of rainfall). Cover crops help — and maybe I should try sponges."

Falling water tables

In Cucamonga Valley, contrary to popular belief, Zinfandel never was irrigated in the early days of the industry. Although the region is warm and the soil is sandy, the water table was so high, according to Paul Hofer, fifth generation grapegrower near the

Ontario Airport, that one could reach water at a mere 27 feet. With the advent of electricity in the region in the 1920s, furrow and concrete pipe irrigation became feasible and were used for Mission grapes — but not for Zinfandel. Zinfandel did well without irrigation then, said Hofer, so watering would have been a waste of money.

"But since people and industry started thronging out here at the end of World War II, the water table over the years has dropped so much that now you have to go down 185 feet to reach it," Hofer says. "Today, most of us have installed overhead moveable aluminum pipes. However, despite the low water table, we still rarely irrigate Zinfandel. Their roots are deep, so we find that only when we have two dry years back to back do we need to supplement annual rainfall.

"We still find it best to deliver water between February 1 and May 1, when the vines are dormant. Irrigating then is like naturally occurring rain, since we deliver only enough water to supplement whatever nature doesn't give us through April — up to the equivalent of 14 inches. Our Zinfandel crop remains at between two to three tons per acre."

Giles and his daughter Parry Mead of Napa Valley also found it necessary to add drip irrigation to their Atlas Peak vineyard in 1999 in order to offset the drain on the water table caused by the Silverado Country Club and accompanying housing developments.

"The ground water has been falling steadily over the years since the country club at the bottom of the hill began stealing all my water," Giles Mead remarked. "We still find water at a reasonable depth, and we have closed storage capacity for about 60,000 gallons.

"Even though the quality is better from dry-farmed, mountain-grown grapes, we can't afford it anymore," added Parry Mead. "We get lower tonnage for high quality fruit, but we haven't been getting larger payments. We nonetheless won't be adding much water, just enough to up the yield a little, about a half-ton per acre, and to sustain the vines through the growing season in the driest of years. A year ago, we got a little over four tons per acre — which isn't bad for head-trained, mountain-grown Zinfandel.

Growers in other traditionally non-irrigated regions are also examining the benefits of supplementary water delivery. In Contra Costa, Fred and Matt Cline are considering drip irrigation to improve the health of their vineyards and yield. Yield from the old non-irrigated vineyards is one to 1½ tons per acre.

"Dry farming does not necessarily produce the best quality grapes," claims Matt Cline. "Stressed vines sometimes produce grapes with too much intensity and concentration. In 1997, we got more rain than usual, and our yield went to three tons per acre. This still is not a high yield, but it was

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twice what we get in a normal rainfall year. Nonetheless, the grapes had as much color and flavor as we usually get, and even better balance in acid, sugar content, and pH. The 1997 wine is one of our best ever. The 1999 vintage also is going to be outstanding. With drip irrigation, we think we might be able to get more vintages like those two."

Dedicated to dry-farming

Despite these benefits from the use of supplemental water delivery to Zinfandel vines, there are still a few diehard and enthusiastic dry farming fans. Frank Nerelli, grandson of Vic Pesenti, a long-time Templeton grower, is one of them.

In March 1997, Nerelli established a three-acre block of Zinfandel beside his house. The budwood was taken from the Pesenti family vineyard, then was heat-treated and certified virus-tested, then bench-grafted onto St. George rootstock. Although the block was established as a non-irrigated vineyard, Nerelli admitted to delivering a couple of gallons of water a week from a tractor-drawn tank to the new vines as the spring weather heated up in May. In 1997, no rain had fallen on Paso Robles after the end of January — a weather rarity. He has since delivered no water — "Not a drop," Nerelli emphasizes.

Nerelli is one of a tiny group of California Zinfandel grapegrowers who continue to practice what has become the nearly lost art of dry farming. He crushed his first vintage in his newly built estate winery in 2000. "Even though the vines were just four years old, they were so robust and prolific that my wife and I dropped half the fruit — over six tons. When you taste that first vintage," Nerelli says confidently, "you'll see the difference dry farming makes to the fruit from even very young vines. For this region and soil, dry farming is the best way to grow Zinfandel.

"This vineyard is a museum piece, an historical reminder of the origins of Zinfandel's greatness. The 50-acre Pesenti vineyard has never received a drop of water beyond what it received during annual rainfall. It is still considered one of the finest Zinfandel vineyards in this region."

Another fan of dry farming was the late George Zeni in Mendocino County. When I first visited him in 1988, he explained his grapegrowing philosophy: "Everything was natural. I never knew what a herbicide was in them days. They never knew anything about any chemicals in those days. About the only thing we used was sulfur for mildew ... And we never *heard* of waterin' down a grape."

When I visited Zeni again in March 1999, just a few months before he died, he proudly showed me his new plantings of non-irrigated Zinfandel on their own roots. He was pleased with how

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well they were doing. One planting was just four years old. "Look at how it has grown. This is all non-irrigated, you know [though his region does receive as much as 75 inches of rain annually], so you have to give the roots some time to establish themselves before you start encouraging too much crop. Give up a year's crop now, and you gain two years' worth later on, is how I see it," he said.

The Turley compromise

New growers such as Larry Turley, who has established a vineyard on Howell Mountain in Napa Valley using budwood from the Hayne Vineyard, believe in the benefits of dry farming but have installed drip irrigation to help their new vines get off to a good start.

The first block of vines in the Turley Vineyard are spaced three feet by six feet, vertically trellised, and budded to a variety of rootstocks, depending on the soils in the vineyard. In 1999–2000, an additional six acres of vines spaced three feet by three feet were planted on a steep hillside. All tillage will be done by hand. The vines will be drip irrigated for the first few years, explains Turley, partly because winds whip through, drying the soil and desiccating the tiny vines.

Winemaker Ehren Jordan corroborates Turley's explanation: "As soon as we give them a little water, you can see them revive. Because we farm organically, it is also a way to deliver nutrients. With the close spacing, we need this efficiency. Once the vines are established, we expect to dry farm.

"As long as you have patience to let the vine establish itself, and to keep its early crops light, it does well without irrigation. It will also live a very long time, since you have given it time to put down deep roots, and become strong. If you want four tons per acre in the third year, you have to beef it up with water and fertilizer. But the vine will probably die in 30 years, and we find that a pretty uninteresting way to farm. Nor do we think the fruit will be as good," concluded Jordan.

Helping Mother Nature

Most premium Zinfandel growers today, whether longtime or recent, have added, or included, some form of water delivery to their vineyards. Because of the growing demand for premium quality Zinfandel, and the top prices being paid for it, most Zinfandel growers cannot afford to be completely dependent on Mother Nature to deliver the necessary rainfall for a consistent yield. Judicious use of supplemental water delivery is becoming the norm, not the exception, even for those growers who prefer dry farming. However, they do not see any inconsistency in their practice of helping out Mother Nature a little.

Amador County grower Frank Alviso expresses this viewpoint as well as anyone: "You get winemakers saying how you can't irrigate. Well, you cannot cause as much harm to the fruit with water as you can with stress. The wages of non-irrigation are often stress on the vines. A stressed vine is like a stressed chicken or any other organism; it is more subject to disease and death.

"The wages of stress on a vine are often high pH in the grapes and flaccid, unstable wines. The judicious application of water at the right time maintains the health of the vine, and therefore grape quality.

"Depending on your soil and climate, you may need to add water early on, and then again after veraison, if the vines begin to show stress in the afternoon. If your vines lose their leaves, you will not get mature, flavorful fruit. That's what water is for, if you have it. Otherwise, you are at the mercy of the seasons.

"If you have a great vineyard in Bordeaux, God knows you get great wines when you get a great season, which might be every seven or eight years or 12 years. Which is fine if you can get *that* kind of money every seven or eight or 12 years. You don't stay in business that way in California. ■

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LABORATORY DESIGN

Doing it right: Case study of Meridian Vineyards

Meridian Vineyards, a division of the Beringer Blass group of companies, is located east of Paso Robles on California's central coast.

New Meridian facilities completed in 2001 include a spacious state-of-the-art laboratory divided into a large main laboratory and a smaller quality control laboratory located adjacent to the bottling line. The total area of both is 3,700 square feet. It was completed in May.

The new laboratory is the brainchild of Ben Bolanos, and like all well-designed labs, is the product of much research and review into the experiences and design of other facilities.

The main laboratory is large and well lit by natural light with windows facing south. The colors are tastefully neutral with white benchtops and stunning poster size photographs (taken by a laboratory staff member) adorning the walls.

One of the main objectives in the lab's design was to separate several key areas, including laboratory administration, wet chemistry, and automated equipment.

This objective has been achieved, and the result is a functional laboratory that encompasses several discrete work areas while not boxing the available space into small claustrophobic rooms. The work areas are delineated with high backed benches that allow for verbal and visual contact among staff in different areas.

Wide walkways and deep counter tops are designed to support the processing of a high volume of samples, and the equipment has been selected for speed and accuracy. The lab is set up in sections that allow grouping of analyses according to sample preparation requirements. The left alcove contains autotitrators to analyze total sulfur dioxide and titratable acidity. In the near corner of this alcove, membrane filterability testing can be performed. The right alcove requires samples to be filtered for spectrophotometric determination of reducing sugars, malic acid, total phenolics, color, and laccase levels. One of the analyzers is fully automated with computerized controls. There is also a dedicated analyzer for determining lactate levels.

The spacious yet integrated environment reduces the risks associated with having lab areas overlap, such as contamination by spillage and electricity in close proximity to wet processes that require large volumes of water. The laboratory can also service the winemaking tasting room, which is nearby.

Administration

The administration area is divided into several cubicles, each with its own computer and telephone facilities. The lab staff has an office along one wall part way between this area and the main laboratory with windows allowing an easy view of both areas.

A fume hood separates the administration area from the main laboratory and also prevents some of the equipment noise from disturbing administrative operations. There are two wide passages on either side of the fume hood, allowing easy access to and from each area.

Laboratory — wet areas

The laboratory wet areas are located on two walls adjoining in one corner. The analyses performed in this area include free and total sulfur dioxide by aspiration, volatile acidity using a cash still, and vintage juice analysis such as brix using the *Anton Paar* DM48 density meter. These analyses are all serviced by natural gas lines, vacuum pump, a water supply, and waste disposal sinks.

Laboratory – equipment areas

The equipment area of the laboratory is by far the largest, and the technologically advanced equipment would be the envy of many a winery lab. This section boasts the Hitachi 911, a fully automated instrument that is used for analyzing glucose/fructose, malic acid, phenolics, and ammonia. Alongside this is a UV-Vis spectrophotometer that is used both as a backup for the Hitachi and also for color measurements on both juice and wine samples.

The autotitration station allows for greater productivity. After a batch of samples is loaded and the titrator is started, technicians can perform other tasks and return after the batch is completed to record results. All reagents and glassware needed for these analyses are stored in nearby cabinets and drawers. The adjacent sink allows for rapid cleanup and disposal of samples.

The area also houses an Alliance Infrascan that is used for accurate alcoholic strength measurement. Adjacent is the Labconco fume hood and a centrifuge. There is also an *YSI* lactate analyzer, which is used for monitoring malolactic fermentations.

In the next area there are two Mettler autotitrators, complete with sample carousels. One is used in the traditional way for pH and titratable acidity, and the other has been set up with a Redox electrode, allowing automated sulfur dioxide via the Ripper method. An atomic absorption spectrophotometer (AAS) is situated nearby. It is used for copper, iron, lead, and potassium analysis.

On the next bench is an ingeniously designed water bath conductivity system that is based on the method developed by Roger Boulton at UC Davis.

There is also a gas chromatograph (GC) which is used for the headspace analysis of common wine sulfides, including hydrogen sulfide, dimethyl sulfide, diethyl sulfide, diethyl disulfide, dimethyl disulfide, and ethyl mercaptan.

Laboratory – quality control

The quality control laboratory is located downstairs, immediately adjacent to the bottling line. Laboratory windows overlook the line, and the walls and doors have been sufficiently soundproofed to prevent disruption from bottling noise. The laboratory is serviced with water, natural gas, vacuum, and nitrogen. The laboratory has a positive flow sterile cabinet and microscope.

The quality control laboratory is also well designed, with separate areas for microbiology, cork, label, and glass quality control. There is also a separate area for line checks where wet chemistry analysis, such as dissolved oxygen, carbon dioxide, and sulfur dioxide, are performed. This lab, while smaller than the main lab, is spacious and well laid out.

Conclusion

A well-designed, functioning laboratory is based upon the expertise of those who are experienced in the lab environment and have the network and resources to draw upon the experiences of others during the design stage. The result, as we have seen, is an efficient and attractive workplace, whether in a large facility like Meridian or a smaller one like St. Francis (see Jan/Feb-2002 ***PWV***). Good laboratory design is not size-dependent. ■

Sue Weeks is an Australian wine laboratory consultant. She provides assistance in areas of formal or informal quality system implementation, method validation and troubleshooting, laboratory setup, personnel selection, and staff training. She also facilitates international wine industry training in conjunction with the Communicating for Agricultural Exchange Program (CAEP). She visits America often and can be contacted through the Bibber International website at www.bibber.com.au or tel: 61 8-8563-2422 or fax: 61 8-8563-2433. She can also be contacted through Gordon Burns at ETS Laboratories at tel: 707/963-4806.

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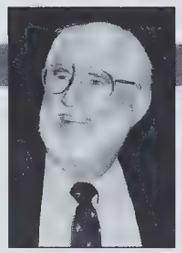

by D.R. Storm, PhD. P.E.

MAIL-ORDER QUEEN BEES

It is probably a good bet that Apiary Magazine, *or whatever the beekeepers' technical journal is called, contains advertisements for queen bees with royal lineage and reproductive capabilities that are off the hive-maker chart.*

My introduction to bee sales occurred in the U.S. Post Office. The post office line was moving slowly, and the person standing immediately in front of me was balancing a dozen small fibreboard boxes with screened openings on two sides.

Upon questioning, the apiarist (as it turned out he was) revealed he sells starter sets for hive building, with the goals of honey production or simultaneous commercial pollination activity in needy orchards. The queen travels alone and must be provided with a small population of drones and workers when she finally arrives at her new destination. It must be noted that the queen is only a reproductive machine who must be fed and protected by her knave and slave bee subjects. The story doesn't end with the shipment of the future super-mom.

Several weeks later, I observed the same beekeeper entering the post office, again carrying queen bee boxes. This time he was being followed by, I speculated, the queens' former roommates. The old hive reunion was short-lived, as the post office emptied rather quickly — beekeeper, followed by panicked patrons, then the bees being shooshed out the door by the fearless postmistress.

Without missing a step, the boxed queens were inserted into empty hive boxes, on the back of the beekeeper's pickup. The wayward bees soon followed. The queens missed their 3:20 pm post office dispatch to their soon-to-be new homes. I later learned that the female pheromone (biological olfactory attractant) emitted by the queen bee is so enduring that worker/drone bees can use it to guide them to the hive or wherever the queen bee happens to be located, or in the case of the post office episode, relocated.

Disinfection without chemicals

PART II

Part I of this two-part series gave a brief summary of the technical requirements for producing clean, safe drinking water using ultraviolet light (UV). Properly designed and operated UV systems can provide mortality for 99.9999% of bacteria, 99.99% of viruses, and 99% of the hard-to-eliminate intestinal parasites *Giardia sp.* and *Cryptosporidium sp.*[1]

A secondary benefit of UV is that it can render water safe to drink without chlorine aftertaste or the creation of halogenated organics (carcinogens created by the reaction of chlorine and organic material (*i.e.*, algae that may be in water or water distribution systems).

Maintenance and operation of UV units

The wavelength of the lethal portion of ultraviolet light (to microorganisms, at least) was described in Part I to be 254 nanometers, which the current generation of mercury vapor lamps is certainly capable of producing. It was also reported that the flux or intensity of the radiated energy must conform to U.S. Dept. of HEW standards of 16,000 wsec/cm^2 (microwatt seconds per square centimeter).

The physiology of UV lamp containment and protection requires that the lamp bulb be surrounded by a protective quartz tube. As the mercury vapor bulb surface temperature is approximately 800ºF, contact with the cool-to-cold water to be disinfected would shatter the delicate UV bulb.[2]

Because the water is in direct contact with the protective quartz cylinder, any fouling of the surface with chemical salts or inorganic sediment could possibly reduce the light intensity below the lethal threshold level. Thus, a cleaning device for the quartz cylinder must be an integral part of the system. It can be as simple as an annular brush that can periodically be used just as the glass cylinders in copy machines must be wiped to maintain finished image quality.

In smaller residential units, a visual inspection of the tube is probably sufficient. Also, having prior knowledge of the chemical quality of the water being treated will aid in managing the quartz cylinder opacity (salts of iron, calcium carbonate, sulfur, and nitrogen are the biggest culprits). For large commercial or industrial systems a light intensity monitor should be utilized. (A true UV monitor and not a light meter, which also records visible light, should be part of the monitoring equipment. Only analog meters measuring from 0 to 100% are acceptable.)[3]

Power outages or bulb failure are the most critical operational problems. Controls should be integrated into the circuitry so that:

a) loss of electric power closes a solenoid valve and opens a bypass valve to a backup gaseous or table chlorination system,

b) an audio and visual alarm system will alert the person with maintenance responsibility of the malfunction, and

c) a backup, standby power supply can ensure continuous operation during primary power service outages.

Table I
Estimated 4-gpm UV system operating costs[2]

Power consumption	20,000/year
Power cost	Calculated at $0.12/kwhr; (Northern California public utility rates) or $2,400 per year
Lamp replacement with assumed one-year life (installed)	$1,000

Note: The reference source provided only relative values of capital cost comparisons of UV versus chlorine or ozone[2] *i.e.:*

	UV	Chlorination	Ozone
Capital cost	low	medium	high

One final precaution should be taken, as it should with all public or pseudo-public water supplies: Sampling and microbiological analyses of the UV-protected supply should be performed in accordance with local, state, or federal guidelines for guaranteeing the safety of the water for potable purposes.[4]

As a minimum, the water should be tested monthly and also seasonally when turbidity and color might interfere with the trans-

mission of the ultraviolet wave energy necessary for cell destruction. A simple total coliform count might be misleading (such as standard analysis for the microbiological safety of water supplies), because the coliform group of bacteria are more susceptible to destruction from UV than their heterotropic brethren. Thus, a Heterotrophic Plate Count (HPC test) may provide a more conservative evaluation of the UV system's operational performance.[5]

Economics

For a single lamp system, the electrical costs (routine maintenance and operation costs excluded) for a system rated at four gallons per minute (gpm) are as follows:

Mini systems for UV disinfection

With the growing interest in and demonstrated reliability of UV systems, it was inevitable that pocket-sized, battery-powered units would appear in the marketplace. The pioneer in this field appears to be Hydro-Photon, Inc., Blue Hill, Maine.[1] The Steri-Pen, its developers claim, can inactivate just about any dangerous organism in drinking water (a 16 oz. glass of water takes about 40 to 50 seconds to disinfect). Requiring four AAA lithium batteries, the hand-held unit can perform 130 treatments before battery change while the UV bulb can perform 5,000 disinfects before needing replacement.

Anyone who has experienced Montezuma's Revenge, Delhi Belly, or the Tijuana Two-Step will embrace this device regardless of cost. (E-mail: spen@hydro-photon.com) ■

David Storm is a consulting civil/sanitary engineer specializing in winery utility systems. He is the author of over 100 technical articles on winery utilities, the author of the reference book Winery Utilities: Planning, Design and Operation *(Aspen Publ., Dec. 1996) and the owner of Winters Winery. E-mail: domaindehiver@yahoo.com*

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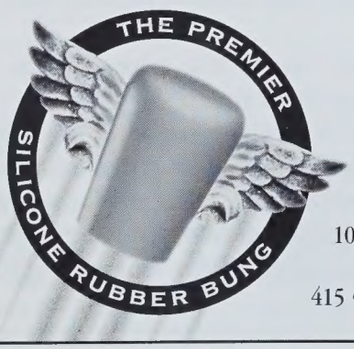

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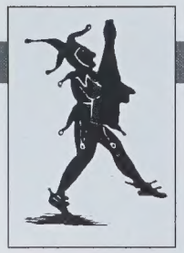

by Jake Lorenzo

Humor

Jake Lorenzo is not a procrastinator. I am lazy. I often screw around the whole day, accomplishing very little, but I am not a procrastinator.

Jake Lorenzo has been writing articles for ***PWV*** for more than 20 years. Occasionally, I'll be traveling or working a case and I'll miss my deadline, but that happens rarely.

About eight weeks ago, I wrote a column. An inspired column, it still makes me laugh. I sent it into the magazine, weeks ahead of deadline. (I told you Jake is not a procrastinator.) A few days later I received a notification from the editor. My column had been rejected. I was crushed. Well, not crushed exactly, I was exasperated. I mean after 20 years, you'd think they'd cut me a little slack. At least, they could have called and discussed it with me. But they opted to send a fax, sort of an electronic rejection letter like the ones I keep getting from publishers for all of my books.

Granted, in the past, ***PWV*** has expressed some concern regarding my eclectic topics. They pretty much insist that each column should talk about wine, or at least tequila.

Over the years I've found hundreds of ways to write about all sorts of things, while somehow linking them to wine. But this rejected column had plenty of wine stuff in it, as well as LSD, intrigue, deception, the Taliban, and all sorts of current interest topics. Did I mention that it was really funny?

Humor, of course, is a very personal thing. Humor is also different from comedy. There are loads of people who write comedy. They sit down and work, rework, and polish their material until it glistens with jocularity. They sell it or perform it or turn it into plays and movies that make us laugh until tears roll down our eyes. They take their twisted views of our normal world, and slant them with their personal wit until the warped images appear to us wildly misshapen. That's what makes us laugh.

I like comedy, but I have great respect for humor. It's hard to do. For Jake Lorenzo, good humor has to be spontaneous. It comes up in conversation. It's spur of the moment, instantly topical, and hard to remember.

Certain things are funny. Sex is funny. Golf is funny. Tennis is not funny. Think about how many jokes you've heard about sex and golf. Now tell me all those tennis jokes.

Humor needs to be fearless. There can be no taboos when you're trying to be funny. Stop for a split second to think about the political correctness of a humorous thought, and it's gone, like a fruity Zinfandel in the face of a brettanomyces infection.

In today's hustle, bustle, post 9/11 world, many people are grumpy, busy, worried, and preoccupied. It's hard to bust 'em on the funny bone, even though a good laugh would make them feel better.

You know what's great about humor. Not everybody laughs at the same stuff. Jake Lorenzo loved Steve Allen, George and Gracie, Groucho, Norm Crosby and Richard Pryor. Bob Hope never cracked me up. W.C. Fields looked *and* talked funny. Buster Keaton was a genius, and Charlie Chaplin was the king. The Three Stooges were repetitive. Lenny Bruce and Sam Kinneson (like Chris Rock today) knew no boundaries, but their visions were often profoundly funny. Tom Green is incredibly gross, but he doesn't make me laugh.

A person with a good sense of humor can make other people laugh at anything, no matter how tragic, no matter how personal, no matter how tasteless the subject. Jake Lorenzo is for laughter. I would rather sit at a table with friends, sip some good wine, and have an evening filled with laughter than anything else in this life. When I look back on all of the friends I have made, I see that the ones I've kept have a sense of humor.

You want to laugh? Have Ray Kaufman tell you about losing his passport down an Asian toilet. Get Jim McCullough to talk about any recent trip. Sit and listen to Jerry Henry talk about anything, or try to figure whatever Molly Sessions was trying to tell you. Get Chuy going on one of his rants, or get Iggy Calamari putting spin on one of his failed experiments. That stuff is funny.

Jake will tell you a secret: A great sense of humor requires one to laugh at himself. When you are dealing with humor, sooner or later, it's going to be your turn in the barrel. The time will come when you are the butt of the jokes. Don't ever get upset, or defensive, or mad, because that just makes you a bigger target. My advice: go with the flow. Laugh along, and try to top them by making jokes at your own expense.

Just as a great bottle of wine is made all the better next to a fine meal, humor is much more enjoyable in the presence of great laughers. Jakelyn's mother is a terrific laugher. She cackles with delight at all sorts of things. She giggles on the phone. She busts a funny bone at sit-coms and even commercials. When we're in a New Orleans theater laughing at Ricky Graham and Becky Allen, her laughter rings out with such clarity, that the actors on stage will announce, "She's back."

Last night, at dinner, we were drinking a bottle of Napa Cabernet. "It's a first release from a newly famous vineyard," I told her.

"It's not bad," she said. "Tastes like a lot of other Napa Cabernets pretending to be better than it is."

"They're getting $85 per bottle. How's that for pretending?"

And she started to laugh. First with a giggle, then laughing, followed by choking while trying to suppress the laughter. "Eighty-five dollars!" she gasped as tears squeezed out of her eyes. She placed the glass down a little clumsily, spilling a few drops.

"Be careful," I entreated, "you just spilled about four dollars worth."

She stuck her fingers into the glass and flicked some wine at me. "Here's another two bucks worth, coming at you."

I dipped my forefinger into the glass, and dabbed it behind my ear. "I don't think you're supposed to drink the stuff, you're meant to wear it."

I guess you had to be there. We had fun. We laughed a bit. We finished the bottle. Dollar for dollar, it certainly wasn't the funniest bottle of wine we've ever shared. No way. You can have plenty of laughs with a $7 Rhône on a spring afternoon with a bunch of winemaking friends. You can laugh your way into the early morning hours with a couple of good bottles of homemade Tempranillo if you're drinking with Steve and Lan, who don't seem to require sleep on weekends.

Humor is so personal. Now, that I think about it, maybe *PWV* was kidding me when they rejected that column. The column must have been so perfect that they were requesting no changes, so they decided to tease me instead. It was Jake Lorenzo's turn in the barrel. You think? ■

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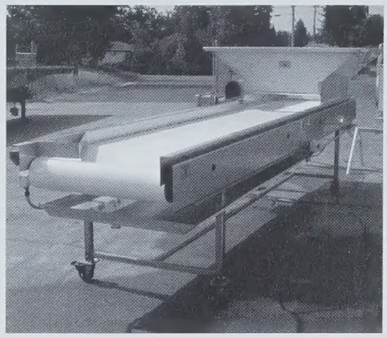

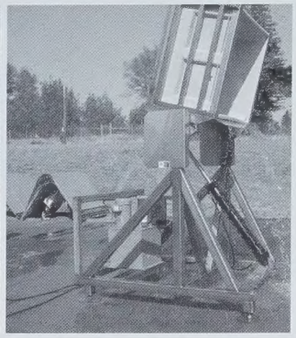

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French Oak

When examining French oak we find the highest tannin of the oak types. Wine has easy access to an array of compounds in the more porous sessile oak, providing multiple extractives. An example is the popular spice notes that stem from extractives such as caryophyllene and copaene. Structurally, there's less tyloses requiring hand splitting following the grain to prevent leakage through the early-wood vessels. Logs sourced from the Office National des Forêts make for more expensive timber. Mixed with more waste in milling, this results in a more expensive barrel that's appreciated for important flavors rather than price.

(the fragile sessile oak, Quercus petraea Liebl.)

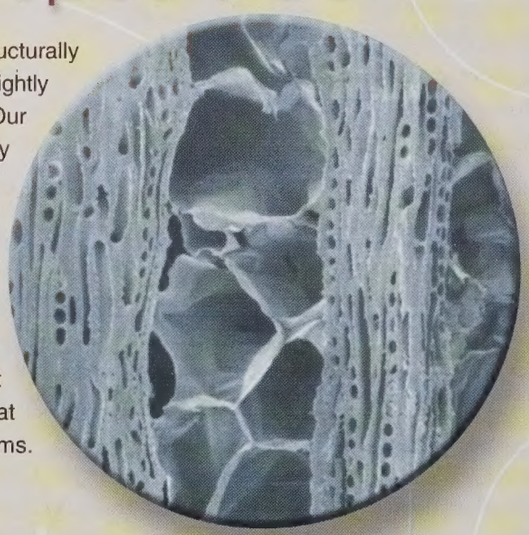
American Oak

Structural differences in American oak's hemicellulose and lignin result in more intense vanilla, wood sugars and toastiness. Because stave timber is purchased from private landowners, log costs are lower, plus its density, high tyloses and straight grain means higher yields, fewer trees, a smart use of natural resources and a lower cost barrel with popular traits.

(the strong Quercus alba)

Eastern European Oak

Under a microscope this sessile oak is structurally similar to what's found in France, yet it has slightly different qualities, including less tannin. Our Eastern European oak grows more slowly and the trees are smaller, creating fine grain and extremely subtle extraction. Research shows that its hemicellulose breaks down easier, forming a different spectrum of toasty aromas. Sourced from both government controlled forests and private land, the logs are less expensive, but lower yields create average cost barrels that add new dimension to barrel programs.



(the slow growth, Quercus petraea Liebl.)

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